AFWAL-TR-83-3066

MATRIX-DOMINATED TIME-DEPENDENT DEFORMATION AND DAMAGE OF GRAPHITE/EPOXY COMPOSITE EXPERIMENTAL DATA UNDER CREEP AND RECOVERY



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The objective of this report is to disseminate experimental data of matrix-dominated time-dependent deformation and time-dependent damage in graphite-epoxy composite. The composite specimens were \(\frac{7}{45}\) T300/5208 laminates tested in tension under creep and creep-recovery with complete instrumentation for stress, strain, and time recordings. Experimental data was recorded and archived in digital form. Polynomial series are fitted to the experimental data for compilation, dissemination and future retrieval.					

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	Data presented herein is accessible to the technical community at large for correlation and the formulation of theory from diverse perspectives, and to meet different goals in fundamental research and engineering applications.			
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PREFACE

The work reported herein was performed by the Lawrence Livermore National Laboratory under the auspices of the U. S. Department of Energy under Contract No. W-7405-ENG-48. Funding was provided by the Flight-Dynamics Laboratory of the Air Force Wright Aeronautical Laboratories, Wright-Patterson Air Force Base, Ohio, 45433, under MOU/MOA entitled "Spectrum Load/Environment Effects in Advanced Fiber Reinforced Laminates," Project 2307, Work Unit 2307N106. Dr. G. P. Sendeckyj, AFWAL/FIBF, was the Air Force Program Monitor.

This program was conducted by the Materials Test and Evaluation Section of the Mechanical Engineering Department, and the Polymers and Composite Mechanics Program, both of the Lawrence Livermore National Laboratory. The work was directed by Dr. E. M. Wu, experimental mechanics performed by Mr. R. J. Sanchez, and data reduction software by Mr. N. O. Nguyen.

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I. Program Objective and Scope

The structural application of composites with specified reliability targets require quantitative characterization of the composites' time-dependent deformation and time-dependent damage properties. The inherent variability of damage requires extensive replication of tests and a large number of samples. The very nature of time-dependent characterization, coupled with the large number of specimen requirements, leads to the necessity of occupying testing facilities for extended periods of time. As a matter of practical constraints, it is frequently not feasible to test the numerous permutations of fiber, matrix, lamination geometries, and load-history profiles. Significant reduction of the testing and data managing effort is possible by first characterizing the basic (or local) aspect of time-dependent deformation and damage separately for the fiber and for the matrix; then predicting the overall composite performance by mechanistic modeling. In graphite/epoxy composites, it is known that the fiber properties are weakly time-dependent; our program, therfore, is directed towards the characterization of matrix-dominated time-dependent properties. The specimens are T300/5208, + 45° , laminates tested in tension. This configuration characterized the matrix-dominated behavior under combined normal and shear stresses, as well as interlaminar stresses. Further partitioning of these effects requires interfacial strength characterization and supplemental testing of the lamina in pure shear and uniaxial transverse tension. These characterizations were not included in this program.

The scope of this program is to provide a data base which can be used to characterize overall matrix-dominated time-dependent deformation and time-dependent strength. Three load-histories (ramp loading, multiple-step and relaxation loading, and creep and recovery loading) were performed to facilitate identification of non-linearity in proportionality and non-linearity in

time-superposition. The data base includes a complete recording of the mechanical stimuli (input) and the material responses (output) by macro-variables of stress and strain. Emphasis in this report is on presentation of the data so that it may be accessible to the technical community at large, and to facilitate correlation and formulation of mechanistic models from diverse perspectives to meet different goals in fundamental research and in engineering applications. Part I of this program summarized the data base established for ramp loading (Report AFWAL-TR-82-3076). Part II of the program summarized the data base established for multiple-step and relaxation loading (Report AFWAL-TR-83-3056).

Work reported herein is the third part of this program -- to provide a data base under creep and recovery load histories. For this report, the material, specimen preparation, and sample configurations are the same as described in Part I and II of this program. The relevant common sections are repeated here for the sake of stand-alone completeness. The experimental configuration and data compilation are unique to the extensional creep and creep recovery presented in this report.

II. Material, Specimen Preparation, and Sample Configuration

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The material tested in this program was NARMCO T300/5208 Graphite/epoxy, widely used by the aerospace industries for structural components of high performance aircrafts.

All samples tested were coupons machined from $[\pm 45]_{S}$, i.e., four ply ± 45 symmetric laminates. The 12" x 12" laminates were fabricated from prepreg tape supplied by the manufacturer. The fabrication method was by vacuum bag molding, using scrim cloth to control fiber volume to be 61% $V_f \pm 2\%$. The laminates were cured in accordance with the manufacturer's specification which

included 1) evacuate in a vacuum-bag; 2) increase temperature from room temperature to 130° C and hold I hour at 135° C; 3) raise temperature to 179° C and hold for 2.5 hours with autoclave pressure at 100 psi; and 4) cool down overnight to 60° C.

The post-cure procedure consisted of 1) a 6-hour ramp to 204° C; 2) hold for 4.5 hours at 204° C; 3) followed by a 6-hour ramp-down to room temperature. Commercially available glass-fiber cloth reinforced circuit board material was used to provide jaw cushioning for the tensile coupons. Strips of this glass tab material were bonded to the 30 cm x 30 cm laminate as shown in Figure 1a.

Coupon samples were machined from the plate by a water-cooled diamond cut-off disk, and then precision drilled in a jig, producing the finished specimen with the configuration indicated in Figure 1b. The finished specimens were inspected for irregularities and machining damage by a 10X stereo microscope. Finally, 350 Ω strain gauges were affixed to the samples as illustrated in Figure 2. Three gauge rosettes (180° , 300° , 60°) were used to collect information for normal and shear strains identifying damage associated with delamination.

III. Experimental Configuration

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The creep and creep-recovery tests were performed on a dead-weight loaded testing machine. The applied weight was transferred to specimens by a 11 to 1 magnification, using a lever and knife edge arrangement. Loading of the weight for creep and unloading of the weight for recovery was performed by a compressed-air actuator with electrical relays for up/down control. The electrical relays are, in turn, activated by a microprocessor-based programmable logic control. Functionally, time for the loading (lowering of the weight) and unloading (lifting of the weight) can be programmed. This control system functions properly under normal circumstances. However, when

electrical power failure was experienced, the logic control assumed the unloading state. This is manifested in the unplanned loadings, which is evident from cursory examination of the load histories reported in the Appendix. To compensate for this design fault in the equipment, after the unplanned power failure unloading, we inserted a creep-recovery period of the duration approximately equal to the creep period. This is consistent with the conventional practice in viscoelastic characterization. For linear viscoelastic materials given recovery time equal to time under creep, full recovery is expected. This, of course, is not true for non-linear behavior, and the data may be used to identify onset of non-linearity in time history.

For each test sample, the cross-sectional area was measured at three locations over a 2-cm length in the middle of the gauge length. The load generated by displacement inputs was measured by a load cell with a capacity approximately 1.5 times the expected maximum load. Load cell output and linearity were calibrated by dead weight. The engineering stress compiled in this report was computed from the measured load divided by the predeformation area.

In-plane strains for the samples were measured by 350 Ω strain gauges in 180° , 300° , and 60° configurations as shown in Figure 2. Excitation voltage for the strain gauges was supplied by a pulse voltage controlled by a microcomputer. The circuit for this pulse voltage and bridge completion is shown in Figure 3. Functionally, when strain gauge measurement is desired, the computer, via a digital ouput, activates a 15-volt source. This source is regulated to 10 volts followed by further fine and coarse adjustments to a reference voltage $V_{\rm ref}$ calibration. This $V_{\rm ref}$ is used to power the single strain gauge on the specimen with external bridge completion resistors, R. The resistors R_1 , R_2 , and R_3 are used for bridge balance at the initial state. The

excitation voltage and the output of the bridge are read into the computer, via a + 10 mV multiplexed analogue to digital converter. After the completion of the readings, the excitation voltage is turned off by software command. The ratio of the output voltage to the excitation voltage is stored to be used to calculate the strain. This pulse voltage system allowed a sufficiently higher excitation voltage to be used without introducing resistance heating in the strain gauge. The accuracy of the strain measurement was limited by the voltage-adjusting resistors which caused drift of the regulated voltage by the long connecting wire between the strain gauge and the completion resistors. The inaccuracy introduced by the excitation voltage drift was compensated by normalizing the output voltage by the excitation voltage. Through a design/instal ion error, the resistance of the connecting wire was not compensated by a thi wire. As a result, the accuracy of the strain measurements was judged to be tween 10 to 15 µ strain.

The actual load applied to the specimen was calibrated by insertion of a load cell in place of the specimen. Fine adjustment of the force is made by leadshots. In this manner, all friction and kinematic parameters were accounted for directly. However, the load change due to the creep induced kinematic change of the load level configuration was not compensated for. This error, by trigonometric calculation, is estimated to be less than 1%. The load is, thus, assumed constant during the creep cycles, and no recording of the load data was taken.

The signals from the strain transducer, together with their excitation, were recorded by a Digital Equipment LSI 11/2 computer, via a 12-bit multiplexed analogue to digital converter. The data were stored on a floppy disk, and then transferred to a Digital Equipment LSI 11/60 hase data archival and data analysis system.

IV. Data Conditioning

We calculate the strain (or load from the load cell) using the following relation

$$\varepsilon = K \frac{V}{V} \frac{\text{out}}{\text{in}}$$

where K is a constant obtained from shunt calibration. For analogue signals, any drift of the input voltage $V_{\hbox{in}}$ will give rise to a corresponding drift in the output voltage. Since the strain is calculated from their ratio, it automatically compensates for any slow drift.

Noise in the input voltage, however, is not self-compensated because of discrete sampling circuitry we employed for the computer data acquisition. The digitizing frequency is not high enough to eliminate the short transient noise. As reported in AFWAL-TR-83-3056, we examined the standard deviation of the noise level and judged that signal beyond two standard deviations are wild transients, and they are eliminated when the following criterion is met:

$$\left|V_{\text{in}}\right| \ge \left|V_{\text{ave}}\right| + \left|2\sigma\right|$$

where σ is the standard deviation.

The entire data set was subjected to this elimination of high level noise in the input voltage signals; thereby, eliminating the associate transient noises in the output signals. A marked improvement of data quality was achieved.

V. Data Smoothing and Data Compaction

For each of the 12 specimens tested in creep and creep-recovery, over 12,000 data points were recorded for the load and strain channels. In order to disseminate these data, we need to smooth out the extraneous noise without altering the data character, and compact the data into a smaller set which can still adequately represent the underlying materials response.

For data smoothing, we know from experience that under tension a ± 45° laminate is viscoelastic and its creep response to a constant load can be adequately represented by an exponential series using one term of the series to model the materials response within one decade in time. In our experiment, within each creep and recovery the load is constant; therefore, the response can be smoothed (i.e., noise eliminated) by a single term exponential over 1/10 per decade in time. That is, the smoothing time constant is 1/10 that of the expected materials response; a conservative way of data smoothing without the risk of altering data. The software algorithm we use to smooth the data is as follows:

- Partition data into ten equal intervals in log t for each decade of data.
- Fit data in time intervals m 1, m, m + 1 to the single term exponential y = A exp B t, where y is the response, t = time, A and B best fit constants by least square.
- 3. Replace entire n data points in this time interval, m, by \bar{y} and \bar{t}

where
$$\bar{t} = \frac{\sum_{i=1}^{n} t_{i}}{n}$$
 $\bar{y} = A \exp B \bar{t}$

The last step (No. 3) places smoothed data at the centroid of the actual recorded data since the data sample interval is not constant and frequently interrupted by power and equipment failure.

Exceptions to this algorithm are:

- 1. When fewer than three data points occur in the mth interval, exponential fit is deleted.
- 2. When the mth interval is at the beginning of the history (i.e., no m-l interval), exponential fit is performed on the mth and (m+l)th interval.
- 3. When the mth interval is at the end of the history (i.e., no m+1 interval), exponential fit is performed on the (m-1)th and mth interval.

Using this algorithm, we smooth the data in accordance to the expected material behavior, and compact the entire data set to 10 data points per decade of time. This algorithm, in effect, performs as a time varying low-pass filter where the cut-off frequency is lowered in logarithmic increasing time. The time is reset to zero and initialized by any mechanical input as by a step-loading or a step-unloading. It is easily seen that this filtering matches with the instantaneous physical behavior when the creep and recovery response are logarithmically deminished with time.

Prior to the data compaction, man-machine interactive computer software was used to identify the load and strain datum level to define the zero time, the time at unloading, and the time at reloading. The man-machine interactive program was described in Part I (Report AFW AL-TR-82-3076.)

Our experience indicated that interactive data conditioning was needed; automatic data conditioning algorithms, without the heuristics of "expected" material response, frequently are misled by noise in the data and give erroneous representations.

All the test data were conditioned interactively by the above operations. This is followed by a conversion of the physical units of load and deformation voltages into stress and strains. Polynomials were fitted to the stress-versus-time and strain-versus-time records. The order of the polynomial was chosen for a fit which was consistent with the expected physical behavior of the materials -- that is, without oscillation and rise or dips at the beginning and at the end of the curve. The data and the respective coefficients of the polynomials are presented in the Appendix. For each specimen, the entire deformation history is first shown graphically for perspective reference. The separate creep and creep-recovery periods are individually magnified showing the actual data, the fit (dotted curve), and the fit coefficients. There are three graphs each for each strain gauge. The recovery data for Step 1 of specimens No. I through No. 6 were not available due to computer failure.

VI. Data Retrieval

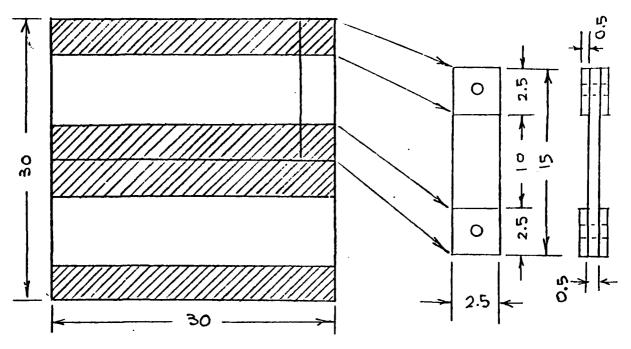
All the information necessary for retrieving the data are contained with the graphs of the respective variables in the Appendix. The form of the polynomial and the parameters optimized to the data are listed. Also, given is the respective actual data range of the independent variable (time) in the polynomial representation. Substitution into the polynomial of time increments within this range assumes the retrieval of the dependent variable (stress or strain) within the accuracy indicated by the multiple correlation coefficient. It should be noted that estimation of the independent variables outside this range constitutes extrapolation from actual data. This should only be done with discretion.

VII. Conclusion

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We reported on the experimental configuration and experimental procedure for testing [± 45]_S T300/5208 graphite/epoxy laminates in multiple-step creep and creep-recovery. A special digital filter with time varying cut-off frequency low pass filter was developed to smooth and compact the data set. The data set was fitted to a polynomial series data retrieval. This data can be used for constitutive modeling of the time-dependent shear laminate behavior and also the damage characterization of time-dependent damage.

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Dimensions in Centimeters

Figure 1: a) Laminate with glass-cloth reinforced tab material (shaded regions)

b) Coupon dimension and configuration

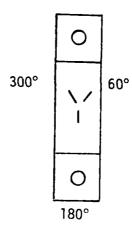
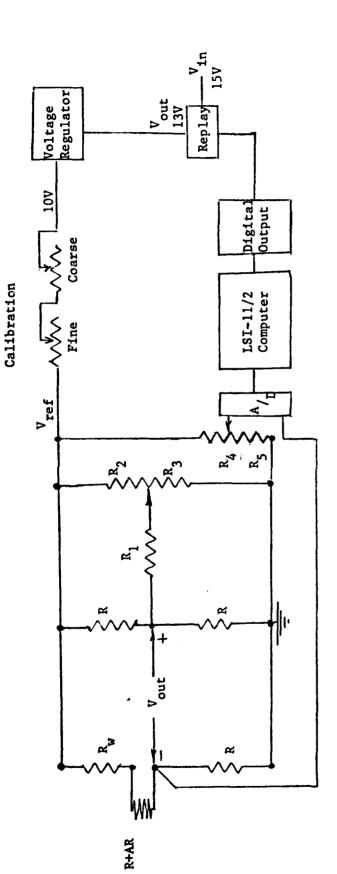


Figure 2: Strain gauge configuration for test coupons



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R+AR Strain Gauge (Specimen Mounted)

R Bridge Completion Resistors

R₂,R₃ Bridge Balance Resistors

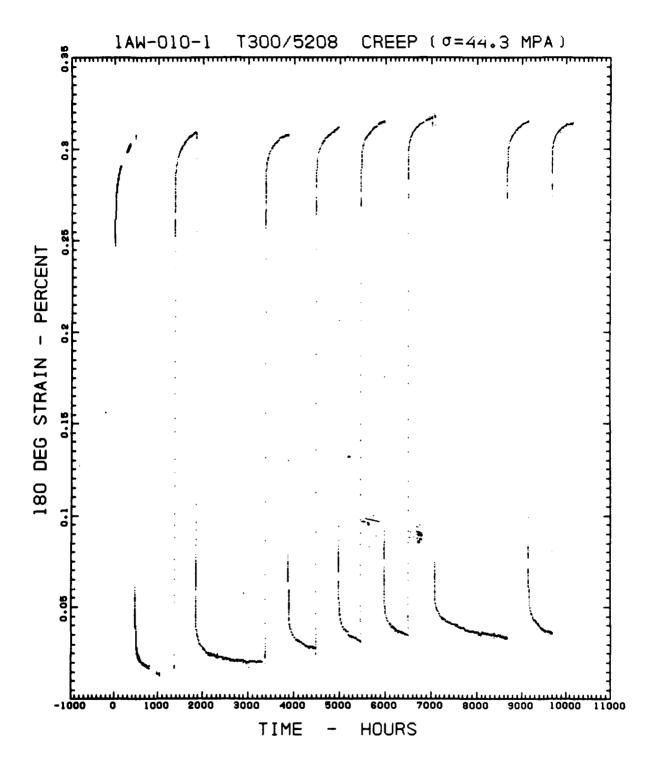
R₄,R₅ Voltage Divider to Reduce V_{ref}

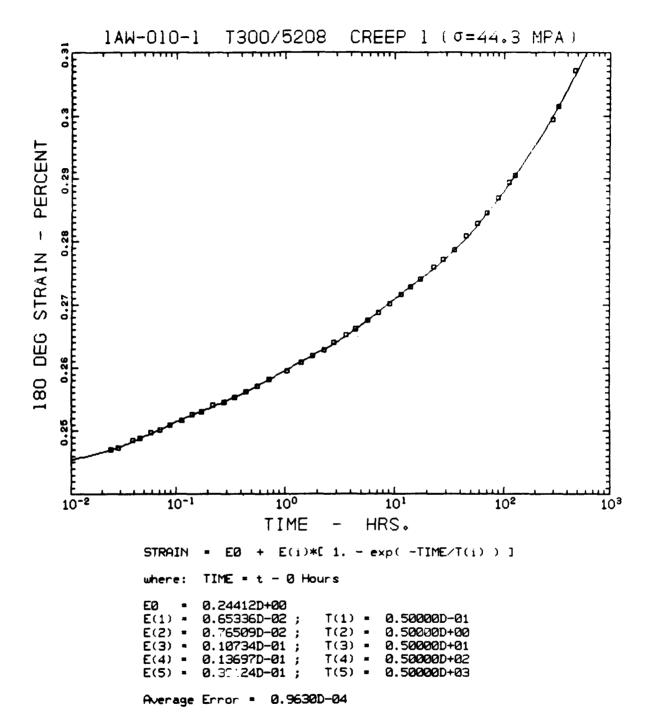
Pulse Voltage Data Acquisition System for Strain Measurement FIGURE 3:

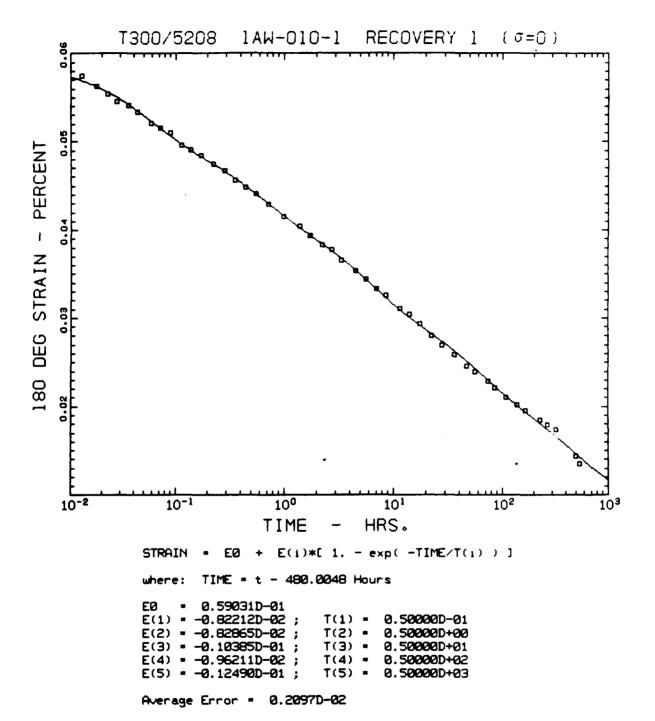
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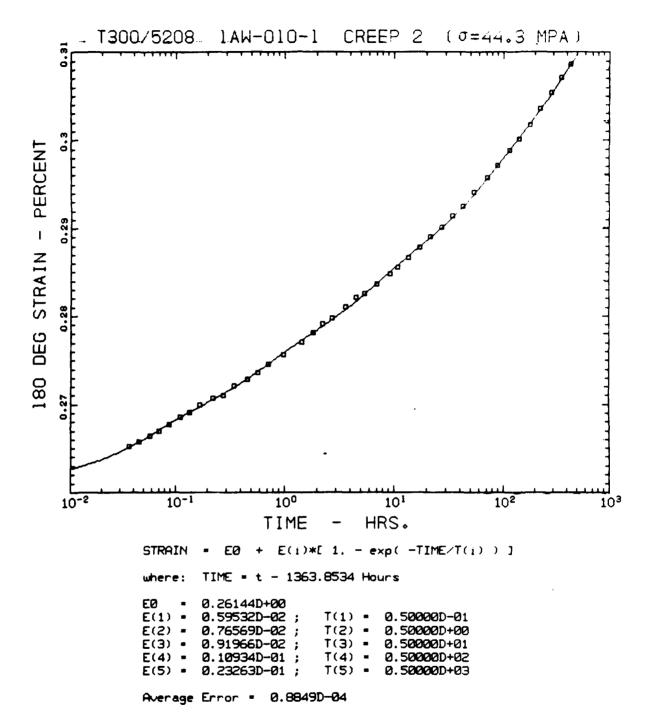
APPENDIX

T300/5208 GRAPHITE/EPOXY DATA FOR MULTIPLE CREEP AND RECOVERY



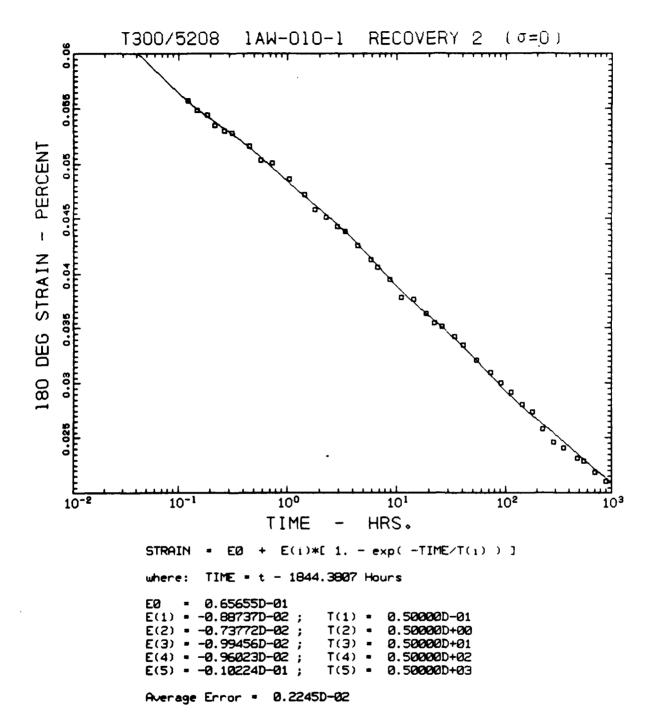




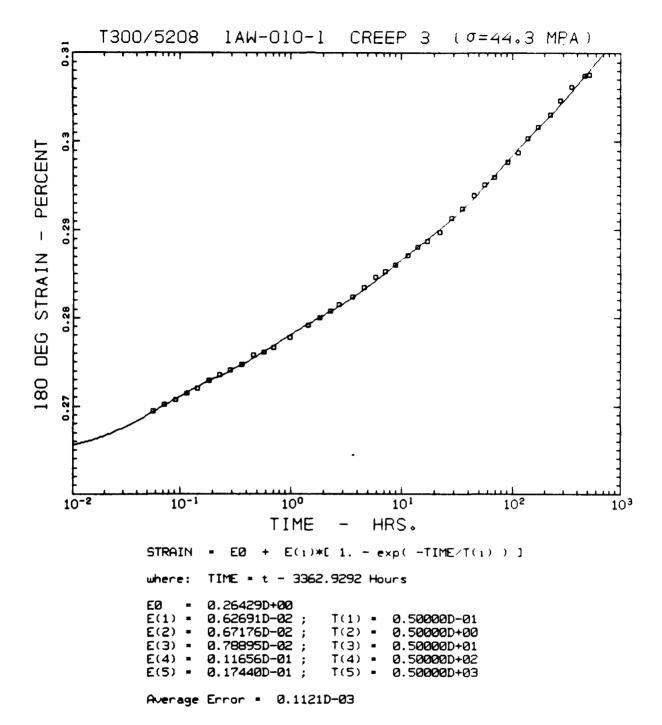


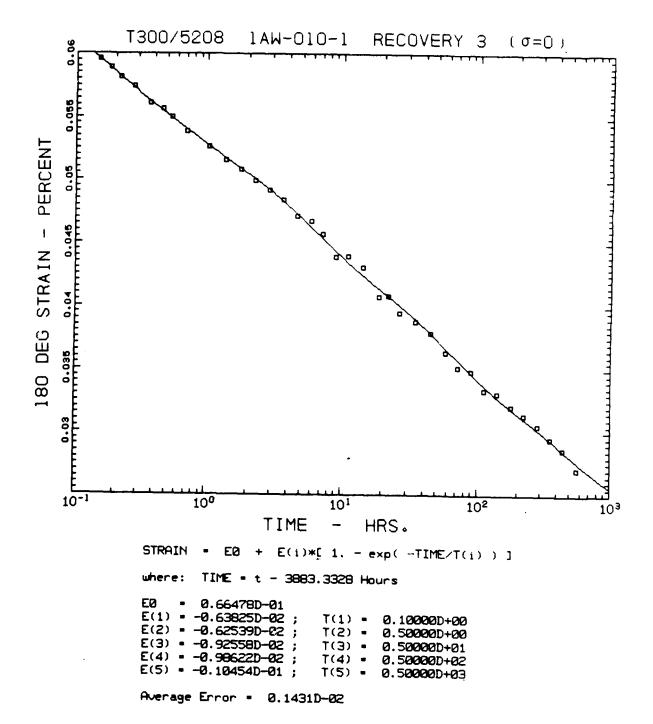
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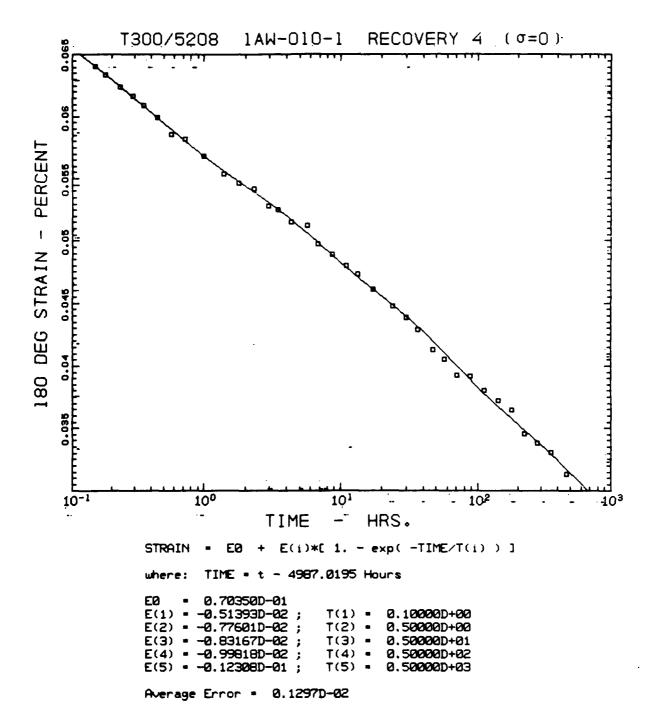
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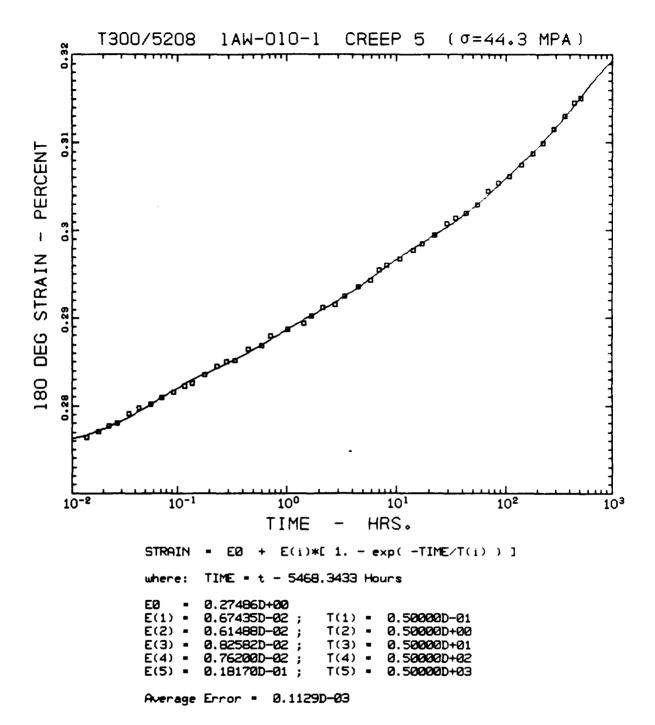


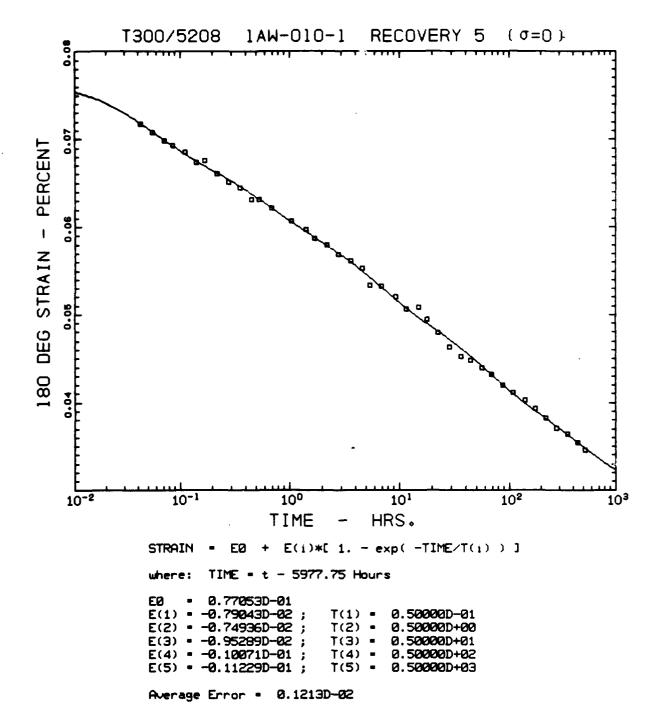


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T300/5208
                            1AW-010-1
                                                CREEP 4 (\sigma=44.3 MPA)
    0.305 0.31
180 DEG STRAIN
                         10°
                                                                   10<sup>2</sup>
    10-1
                                              101
                                                                                        10<sup>3</sup>
                                   TIME
                                              - HRS.
                 STRAIN = E0 + E(i)*[ 1. - exp(-TIME/T(i)) ]
                          TIME = t - 4484.9224 Hours
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                 EØ
                          0.13038D-02;
0.64590D-02;
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                                                       0.10000D+00
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                                                      0.50000D+00
                 E(2) =
                                             T(2) =
                          0.77211D-02;
0.82031D-02;
                                                      0.50000D+01
                 E(3) =
                                             T(3) -
                                             T(4) = 0.50000D+02

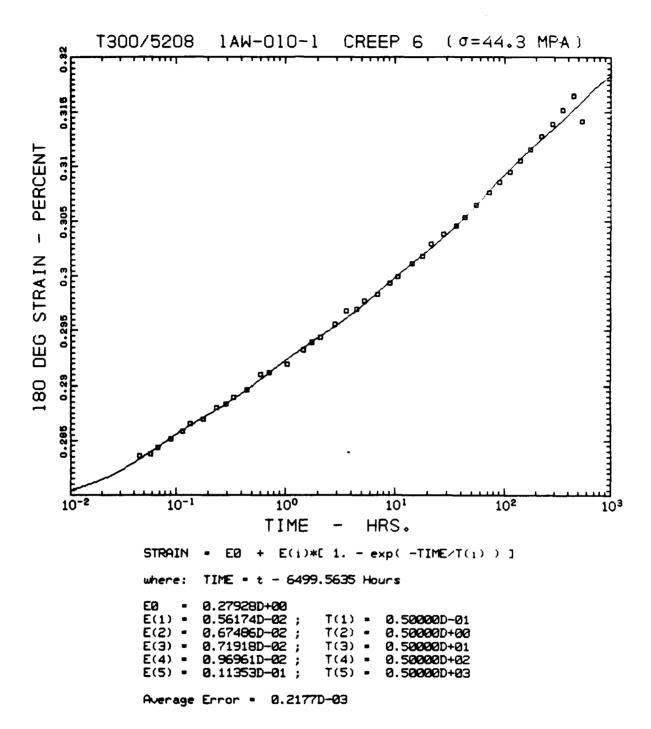
T(5) = 0.50000D+03
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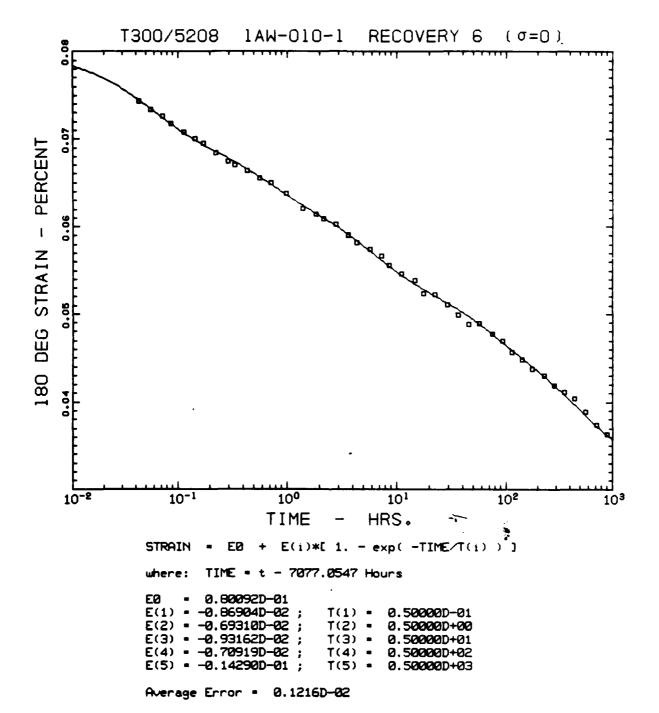


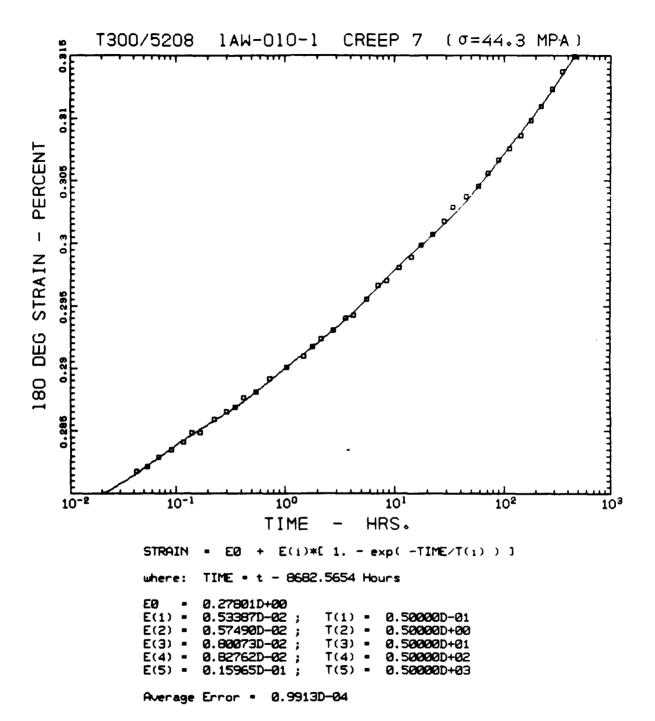




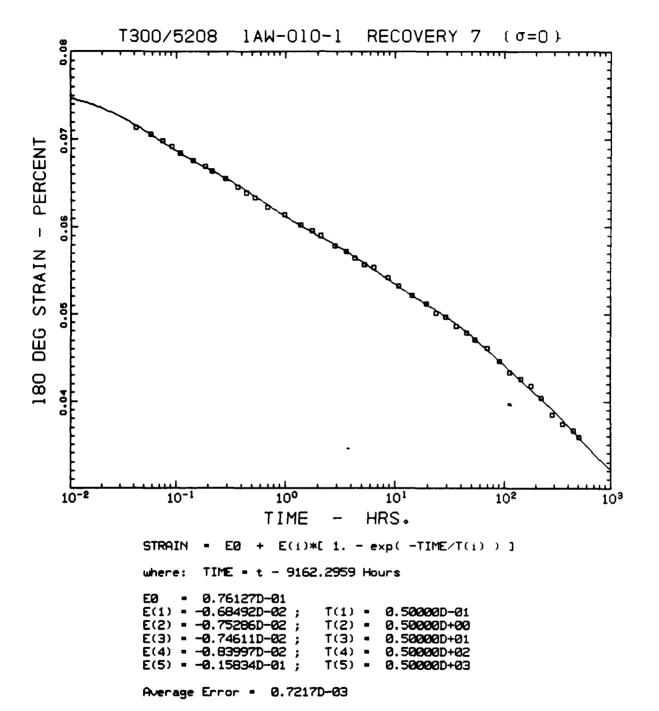
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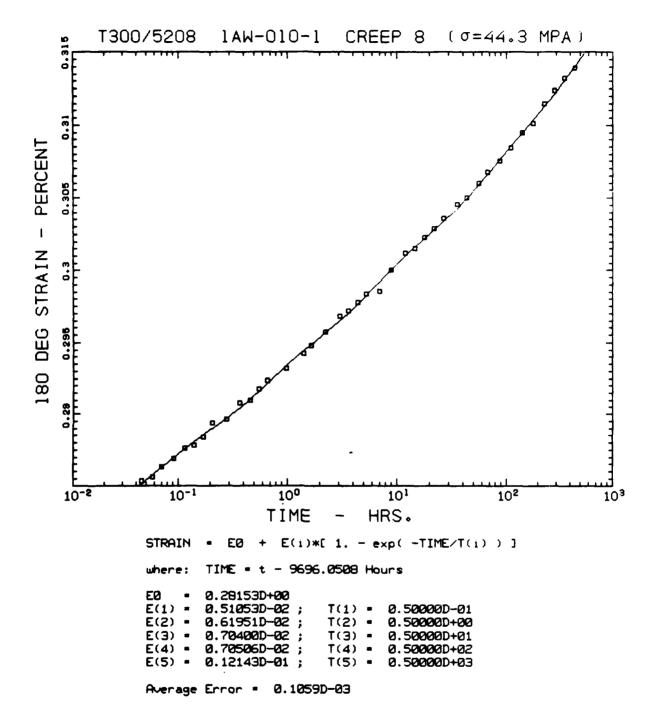


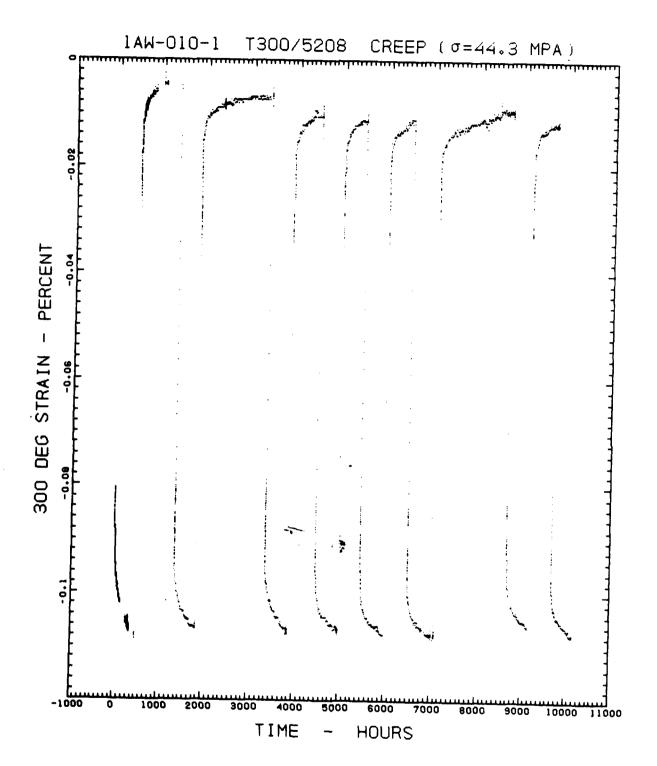


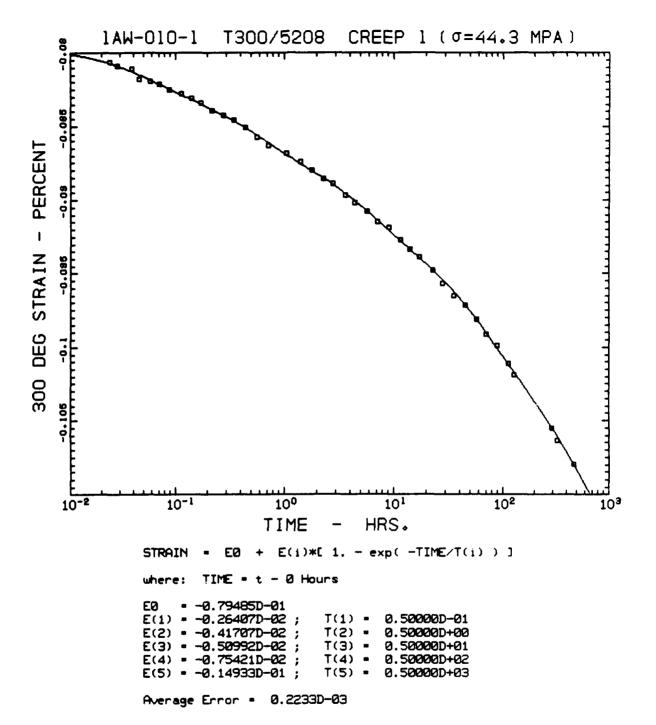


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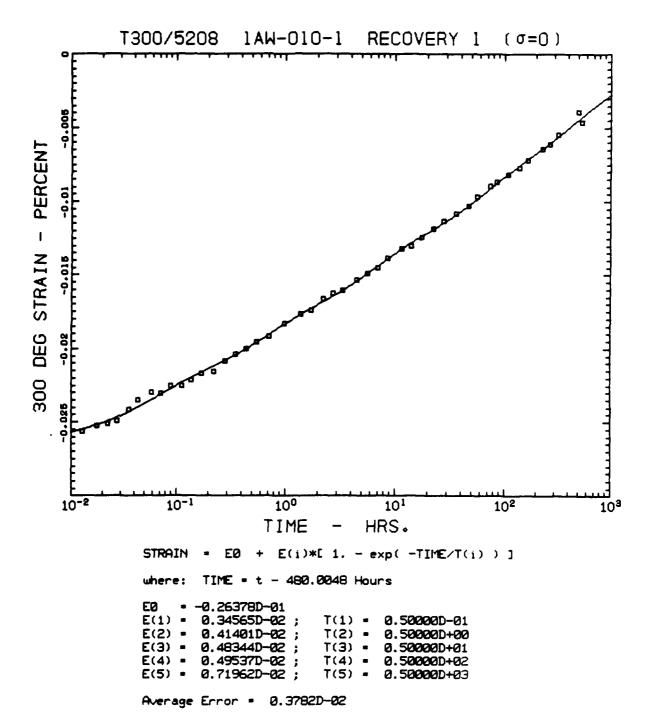


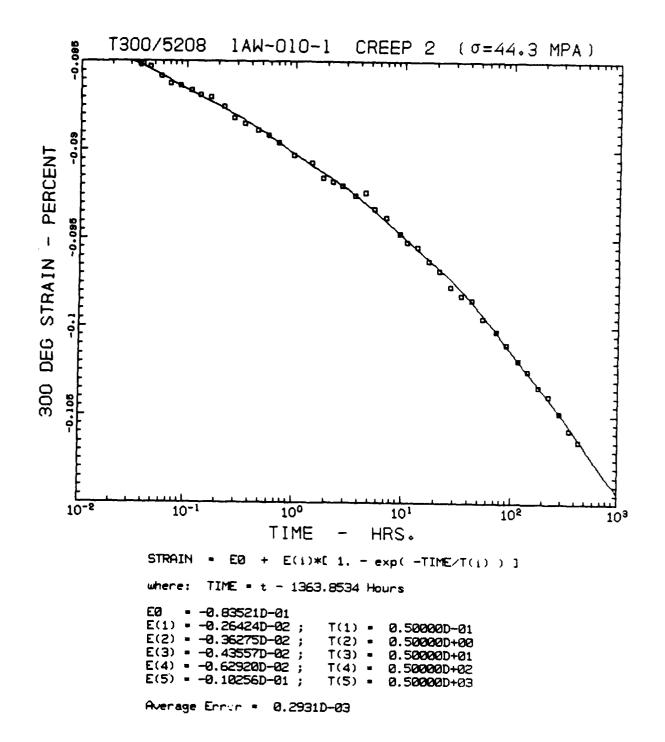


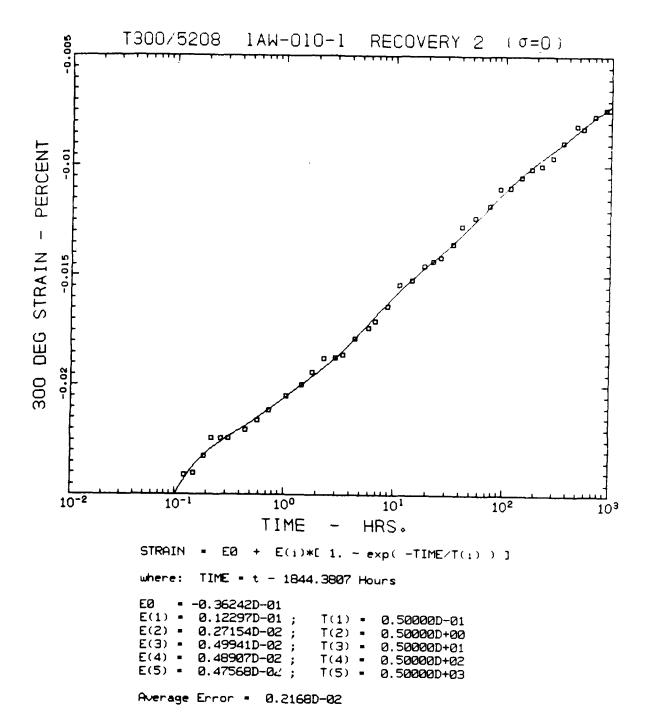


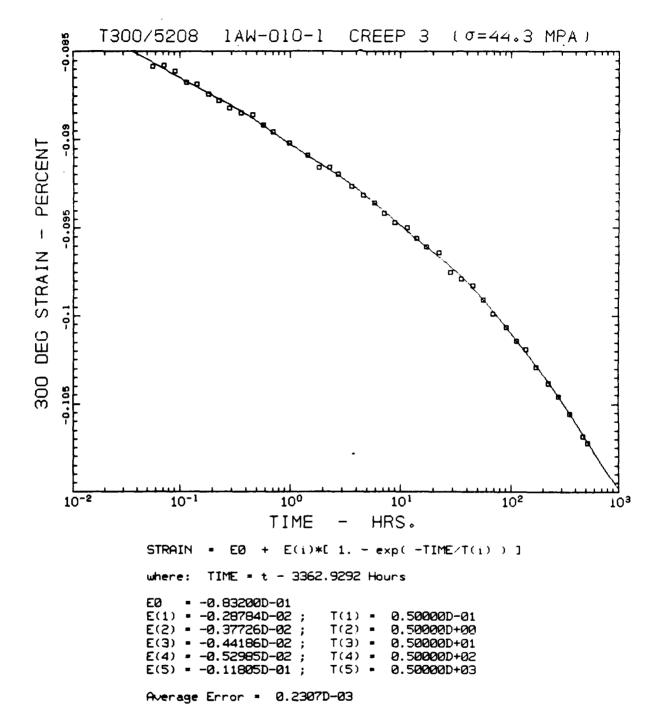


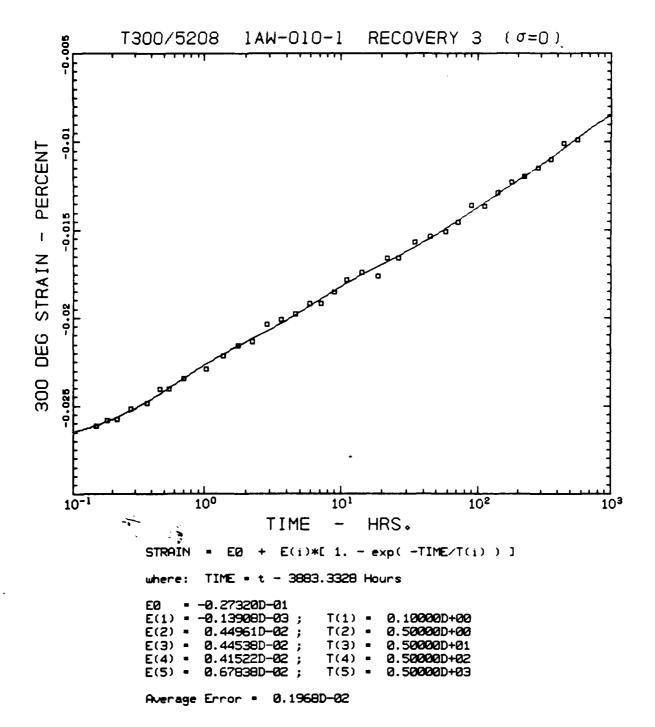
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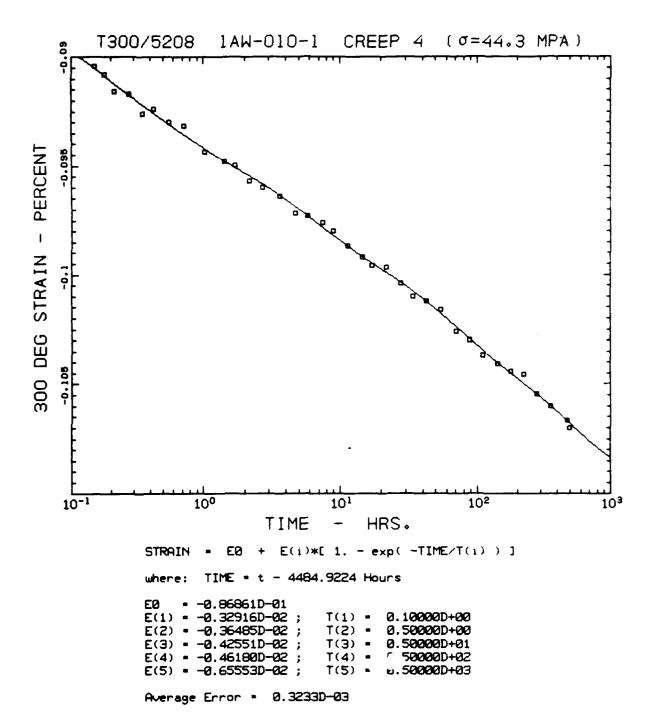


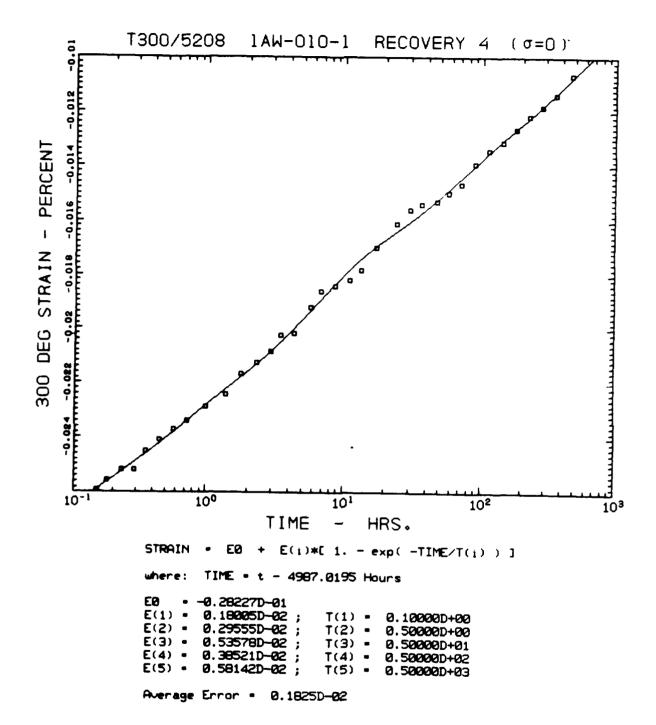


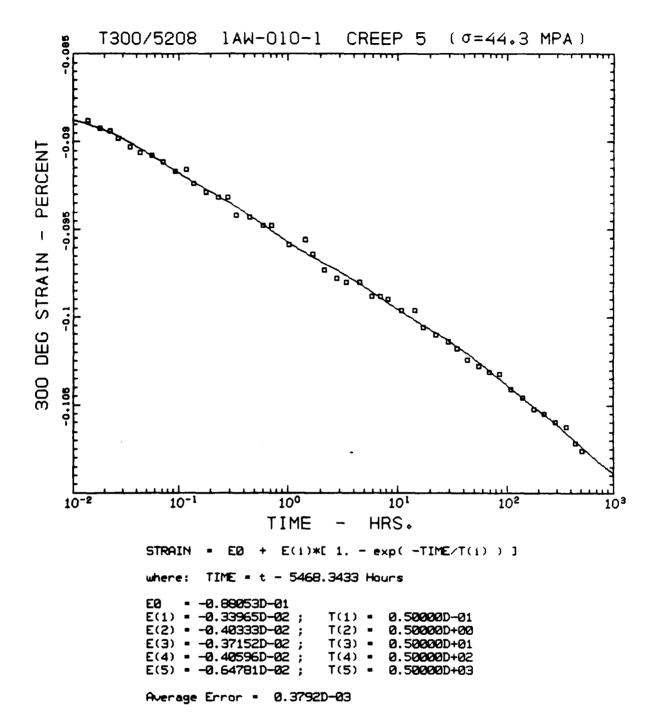


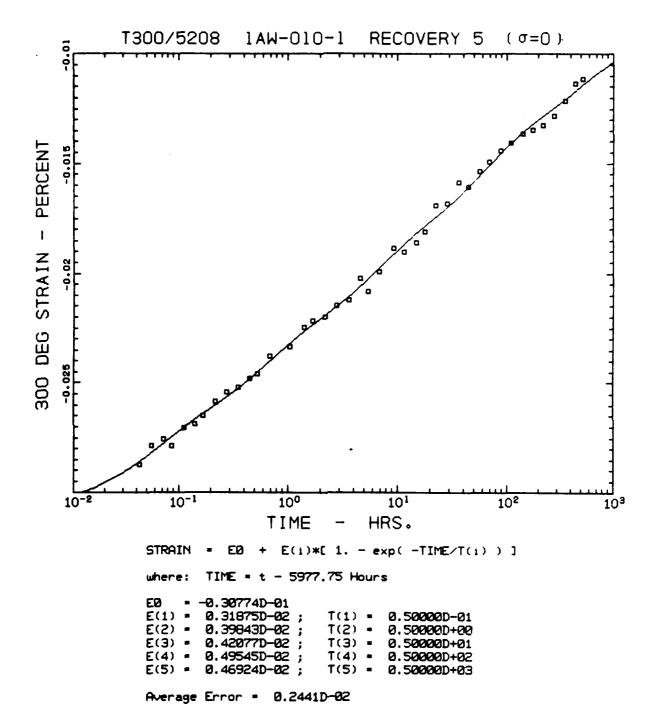


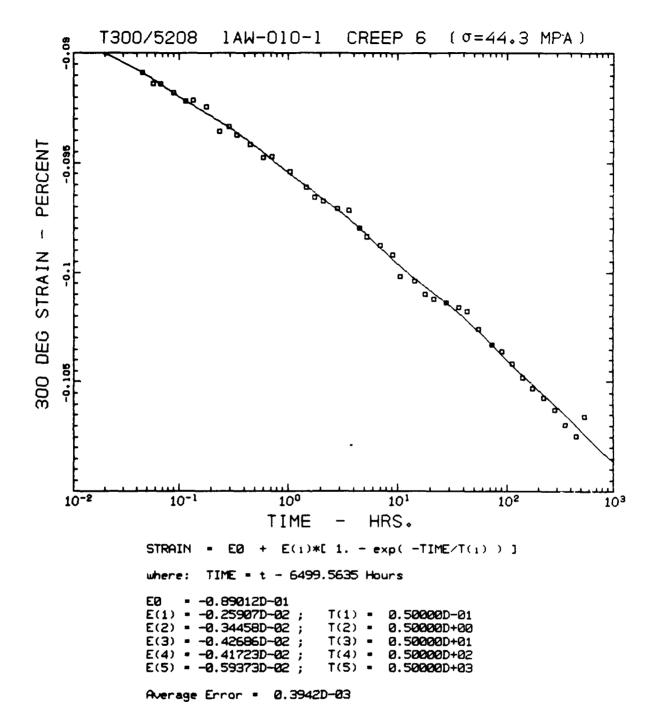






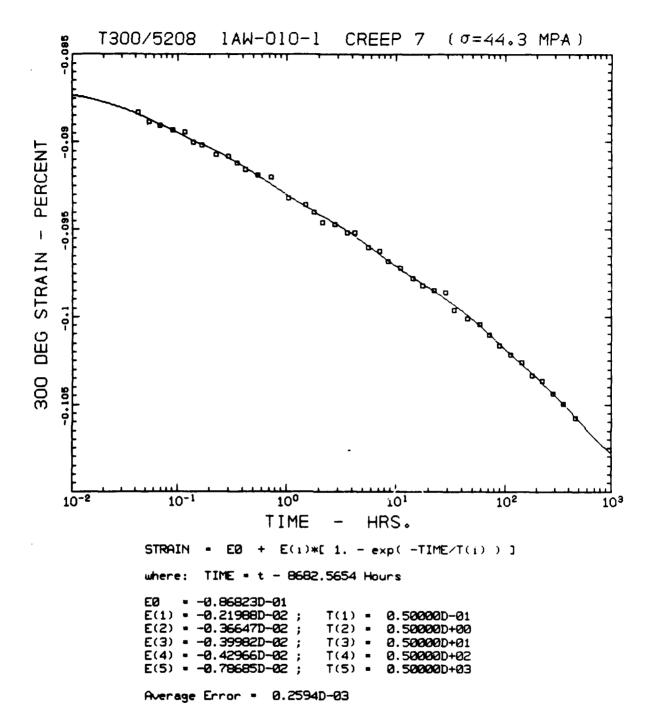


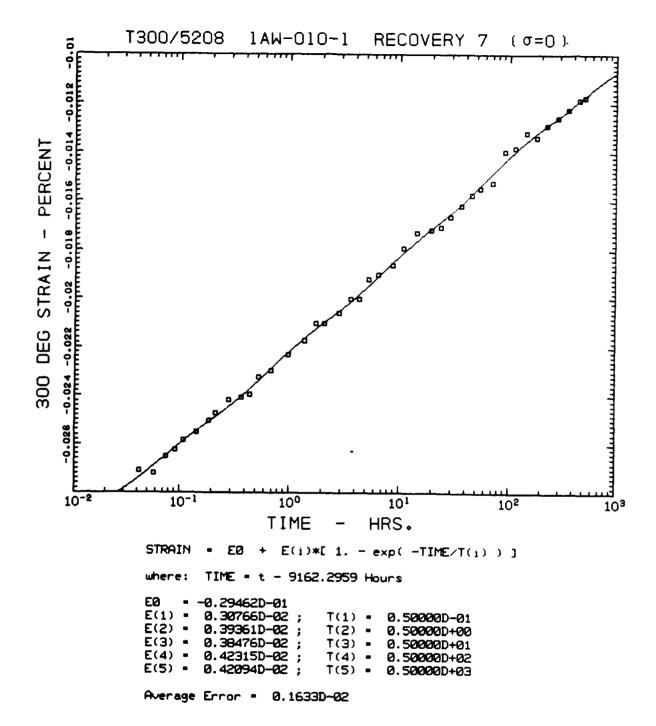


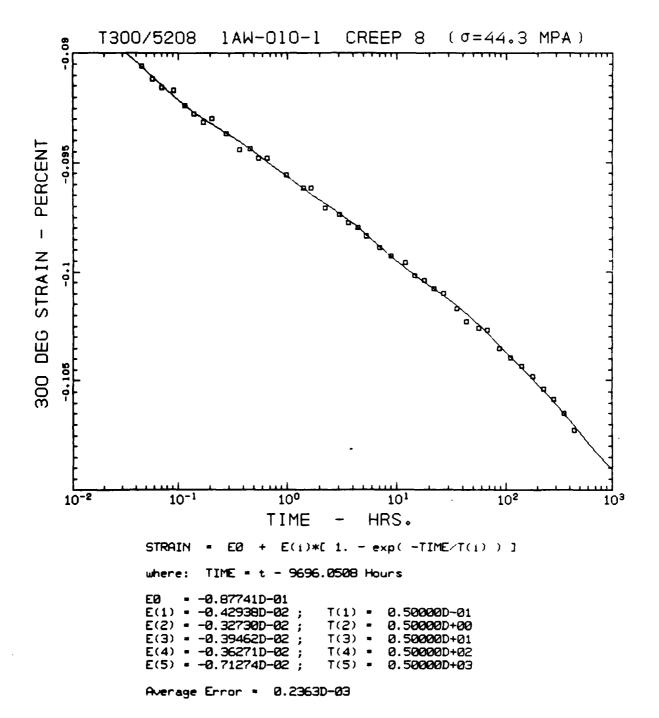


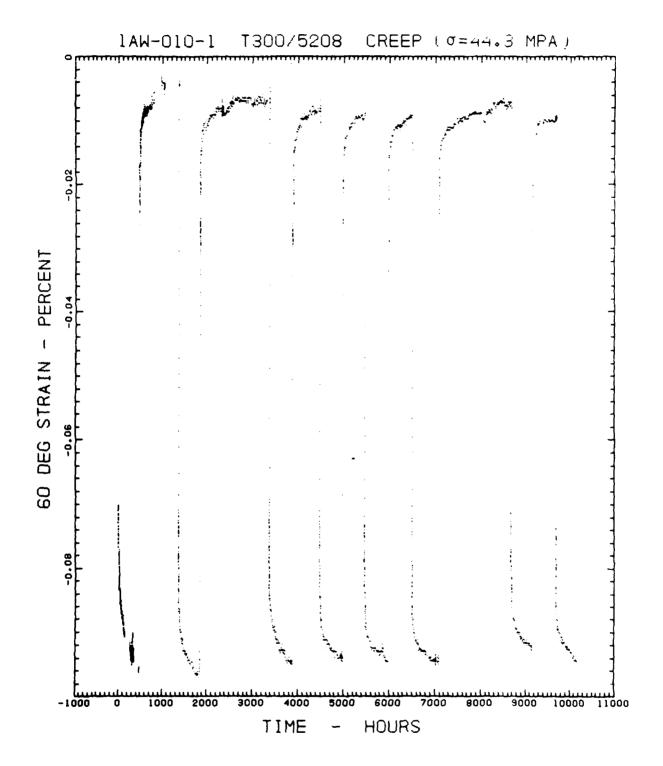
```
T300/5208
                                1AW-010-1
                                                   RECOVERY 6
                                                                           (σ=0).
300 DEG STRAIN - PERCENT
                                       100
                                                        101
    10-2
                     10-1
                                                                          10<sup>2</sup>
                                     TIME
                                                     HRS.
                                  + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                           TIME = t - 7077.0547 Hours
                         -0.31085D-01
                           0.22887D-02;
0.42898D-02;
                  E(1) =
                                               T(1) =
                                                        0.50000D-01
                  E(2) -
                                               T(2) =
                                                        0.50000D+00
                           0.45212D-02;
0.37228D-02;
0.65530D-02;
                  E(3) =
                                               T(3) =
                                                        0.50000D+01
                                              T(4) =
T(5) =
                  E(4) =
                                                        0.50000D+02
                                                        0.50000D+03
```

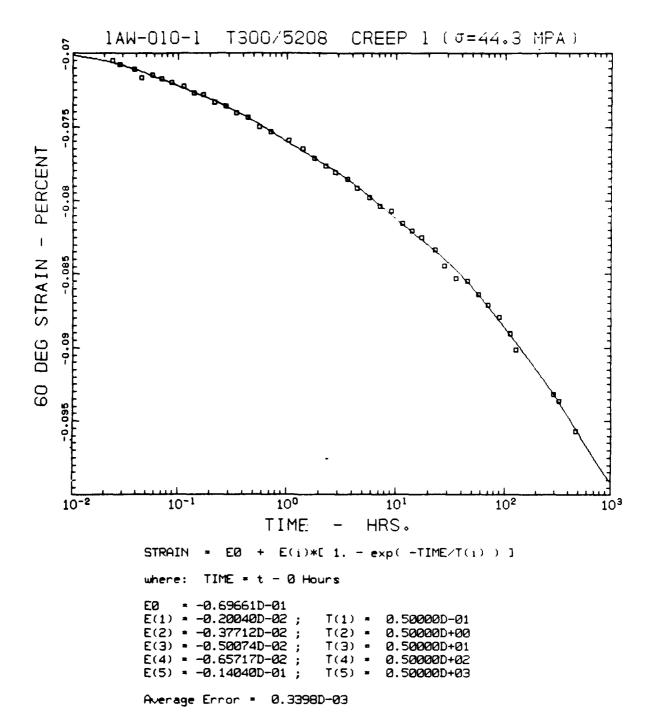
Average Error = 0.3300D-02

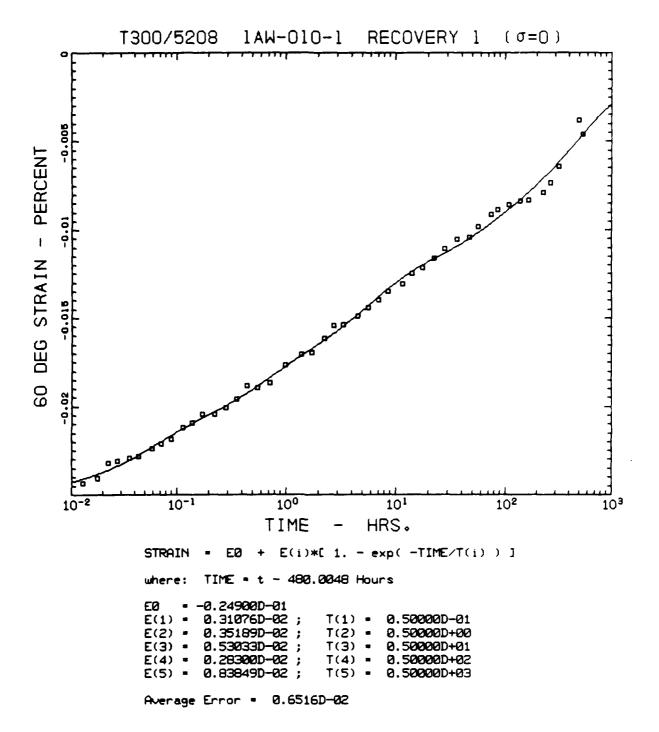


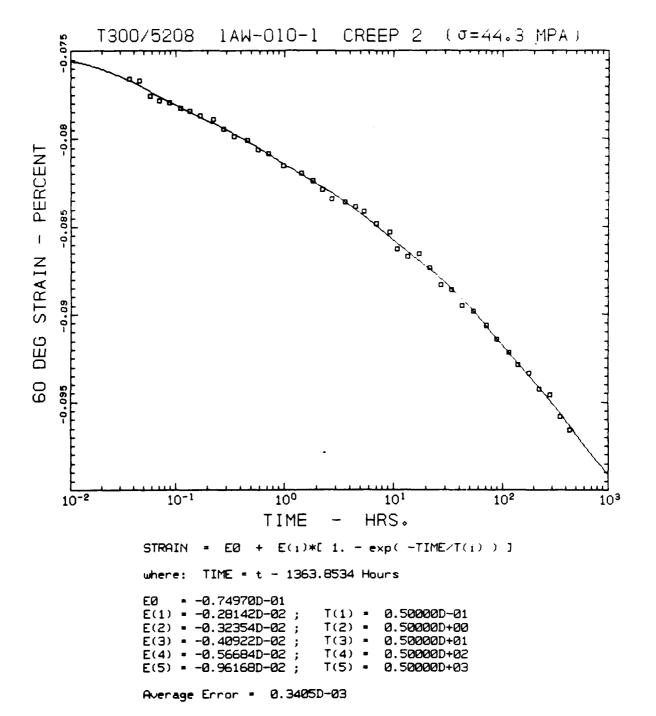


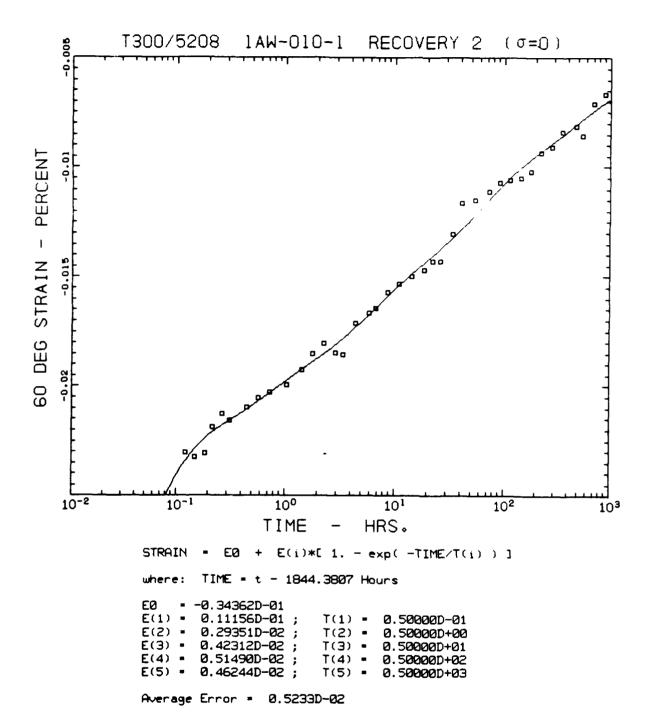








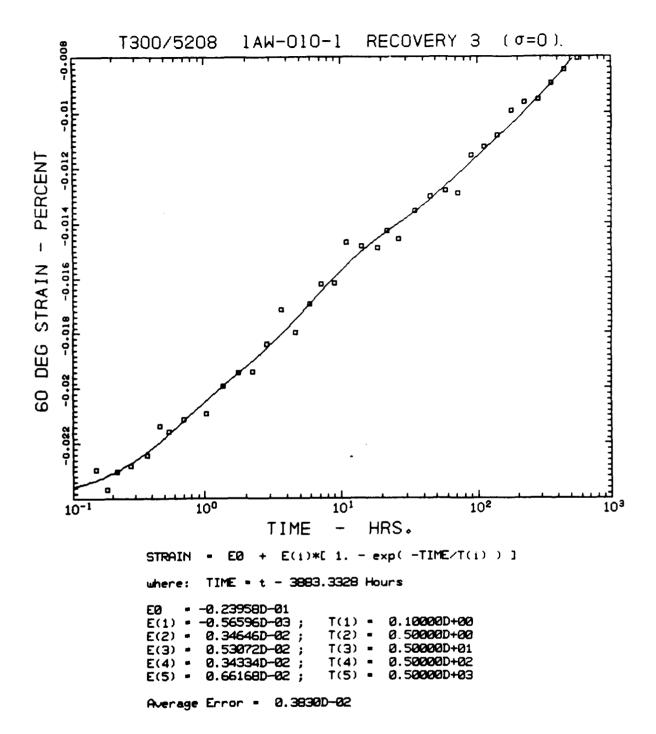


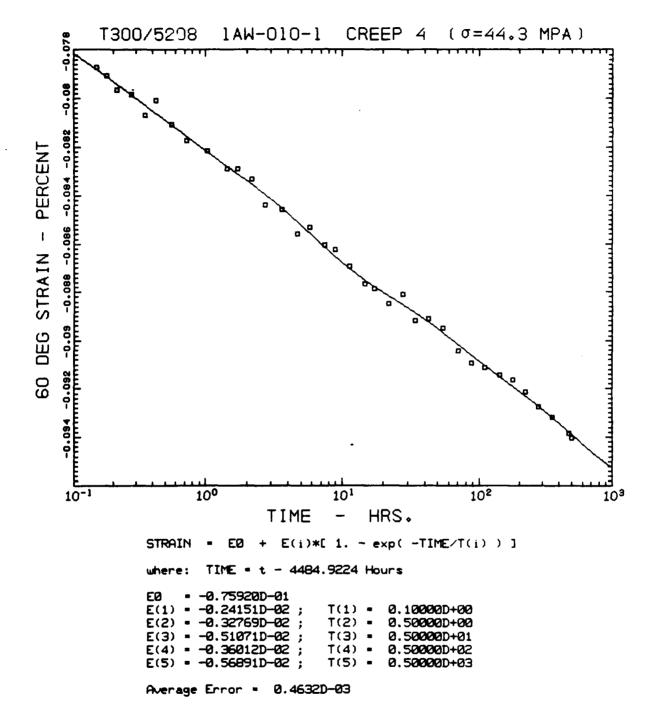


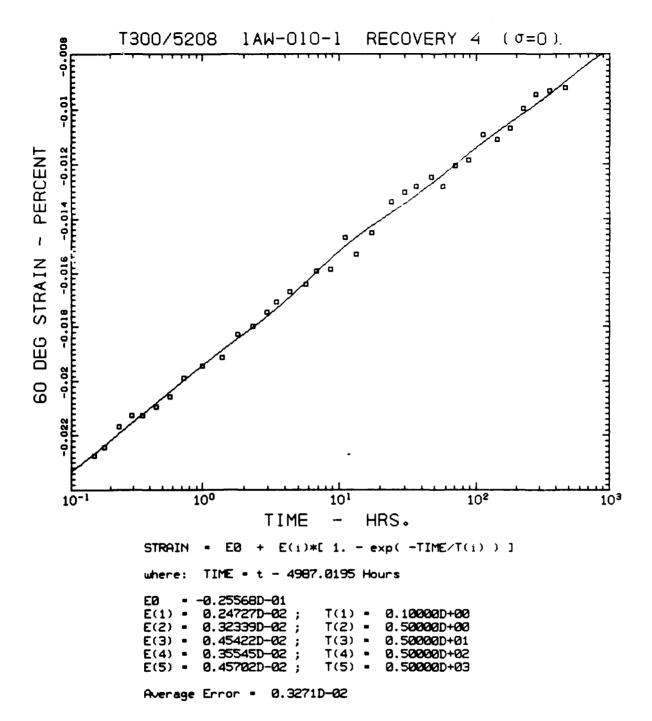
```
(\sigma=44.3 \text{ MPA})
            T300/5208
                                     1AW-010-1
                                                             CREEP 3
60 DEG STRAIN - PERCENT
      10..5
                           10-1
                                                100
                                                                      101
                                                                                           10<sup>2</sup>
                                                                                                                 10<sup>3</sup>
                                              TIME
                                                                  HRS.
                      STRAIN
                                           + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                                 TIME = t - 3362.9292 Hours
                      where:
                             - -0.73602D-01
                      EØ
                      E(1) = -0.16720D - 02;

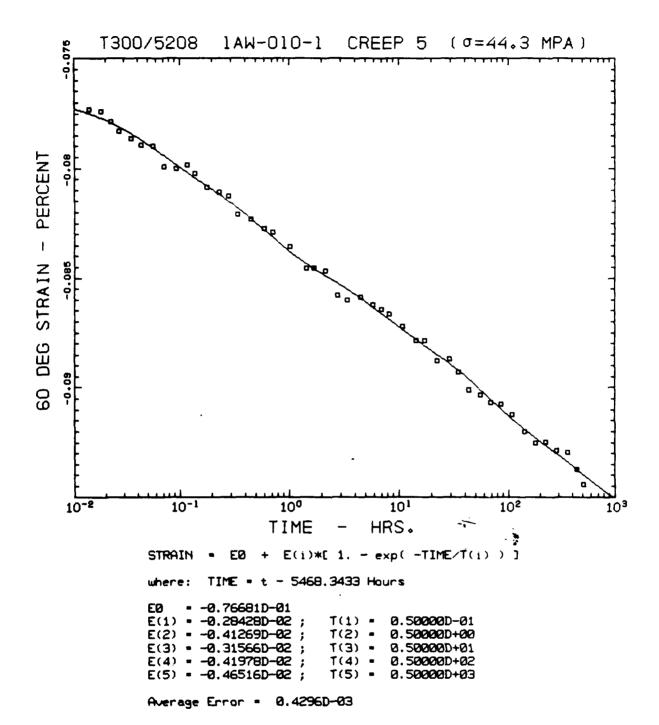
E(2) = -0.39125D - 02;
                                                                     0.50000D-01
                                                          T(1) =
                                                          T(2) =
                                                                     0.50000D+00
                     E(3) = -0.36390D-02;
E(4) = -0.51210D-02;
E(5) = -0.10539D-01;
                                                         T(3) = 0.50000D+01
T(4) = 0.50000D+02
T(5) = 0.50000D+03
```

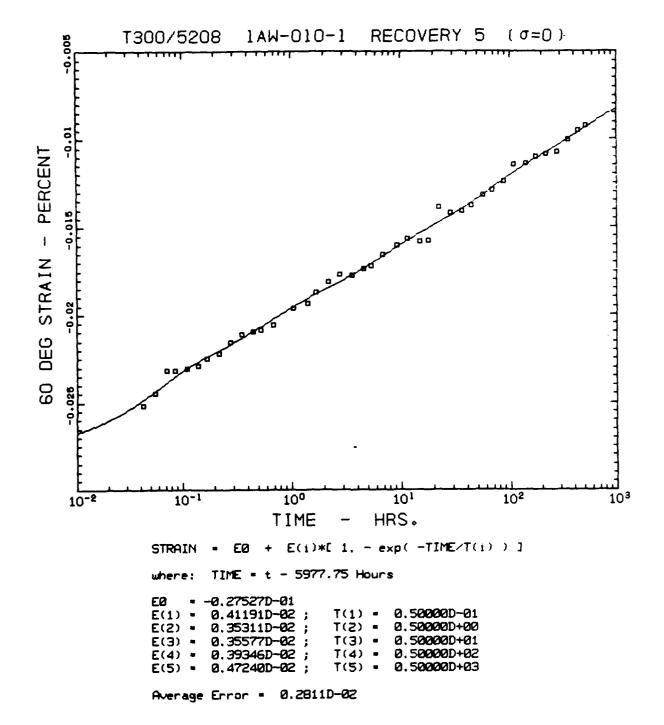
Average Error = 0.3383D-03

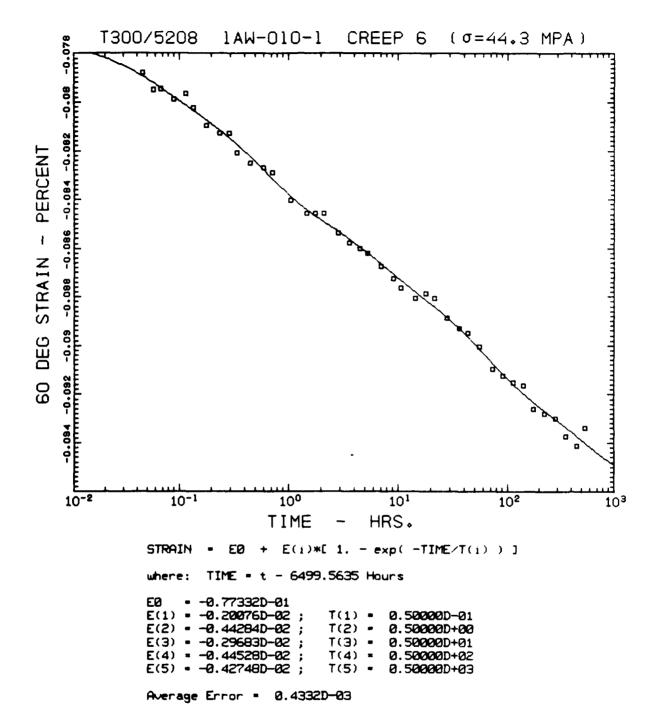


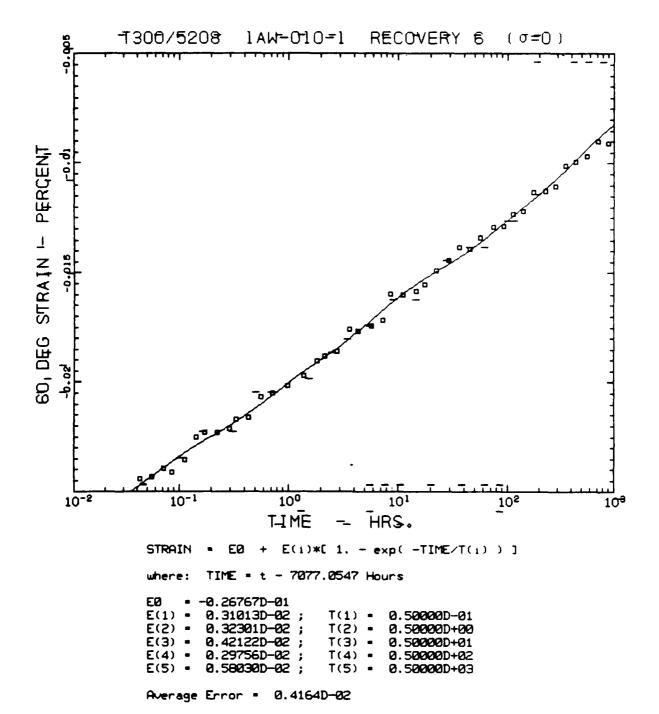




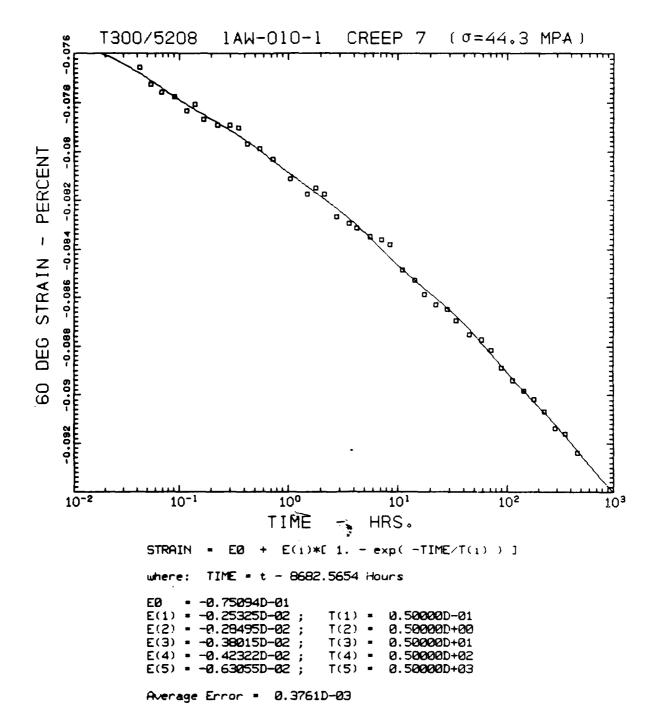


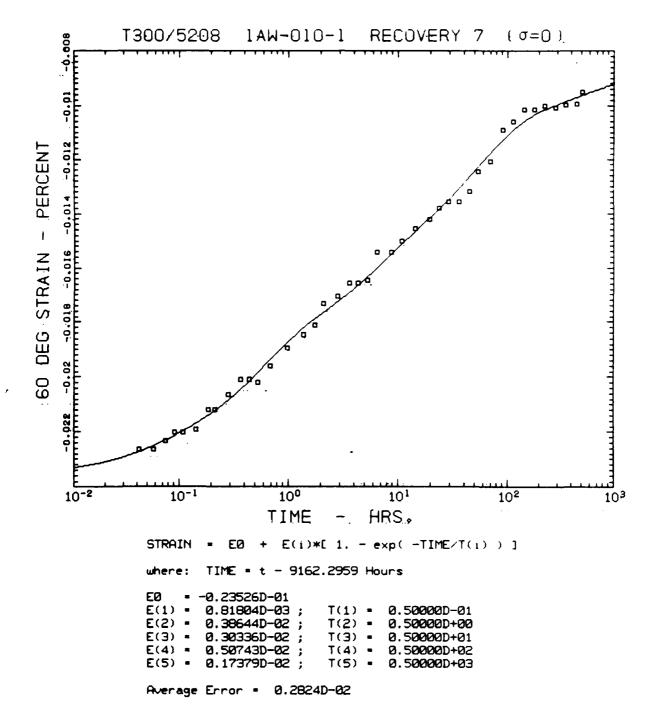


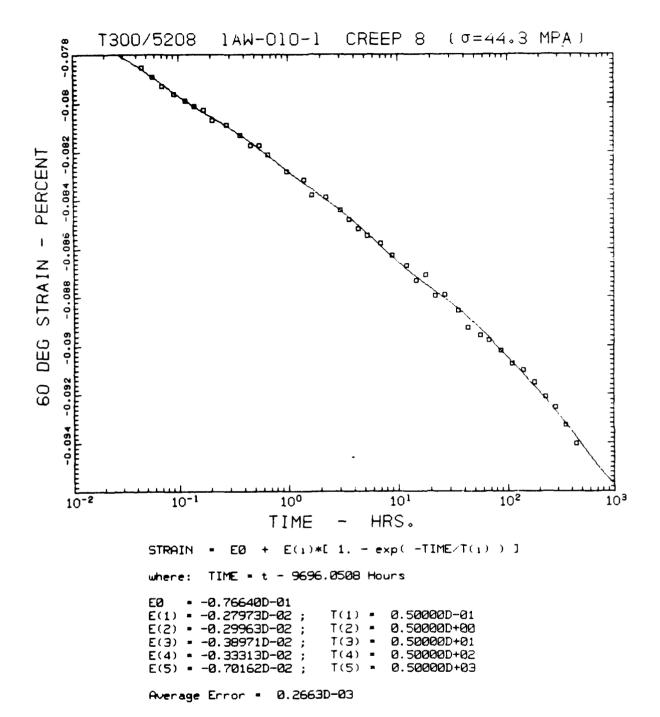


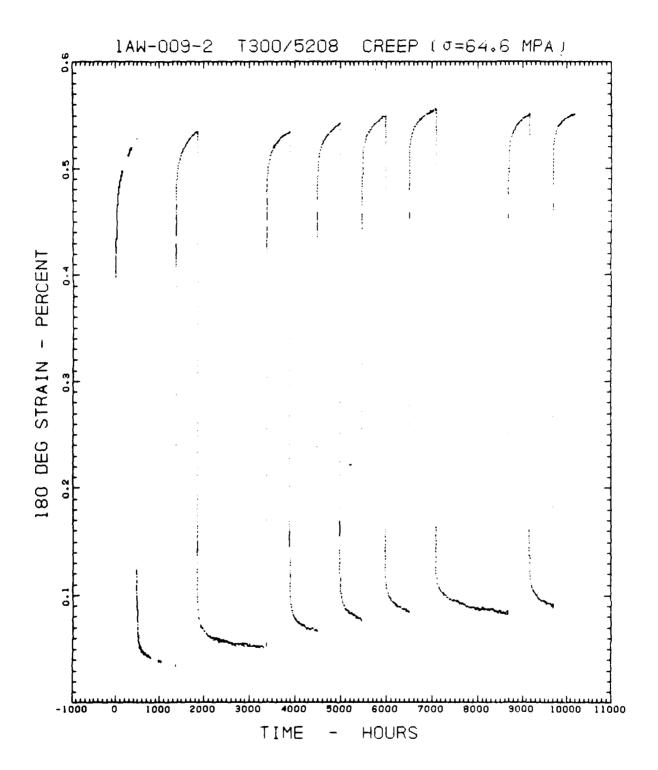


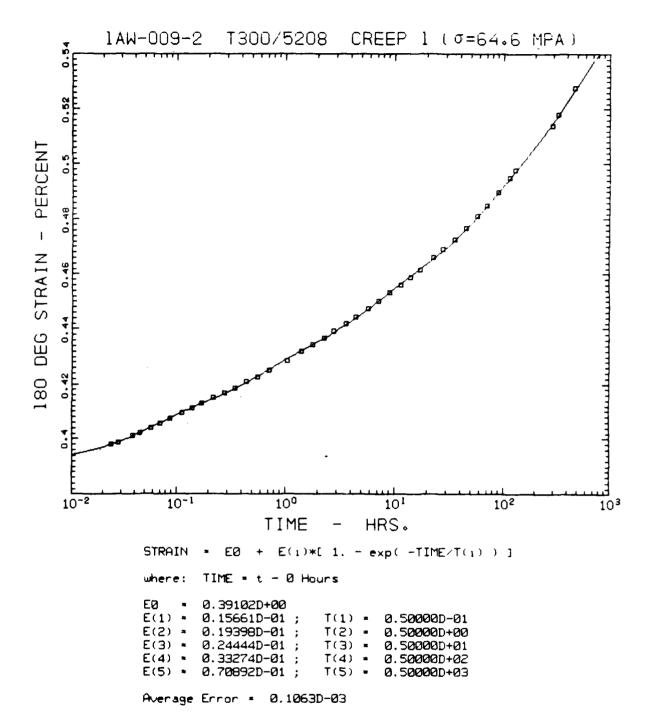
Section - Language - Appendix - Section - Sections - Assessment - Asse

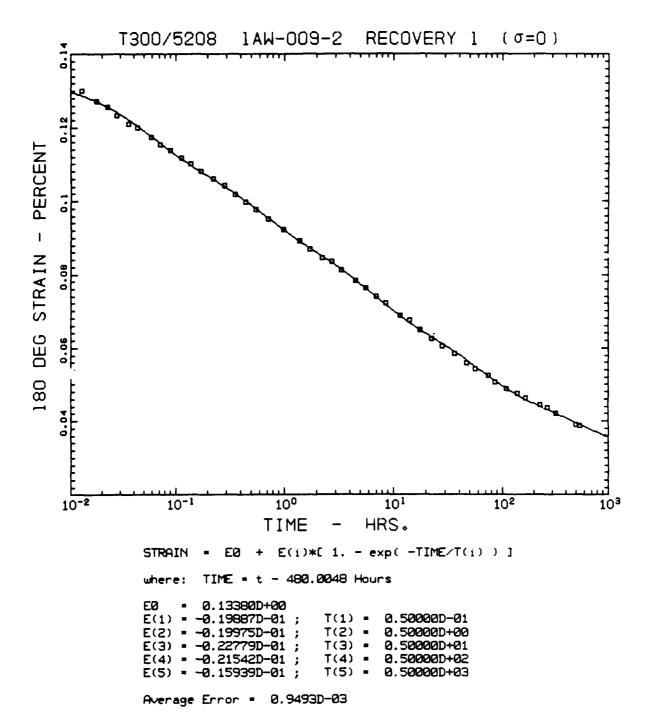


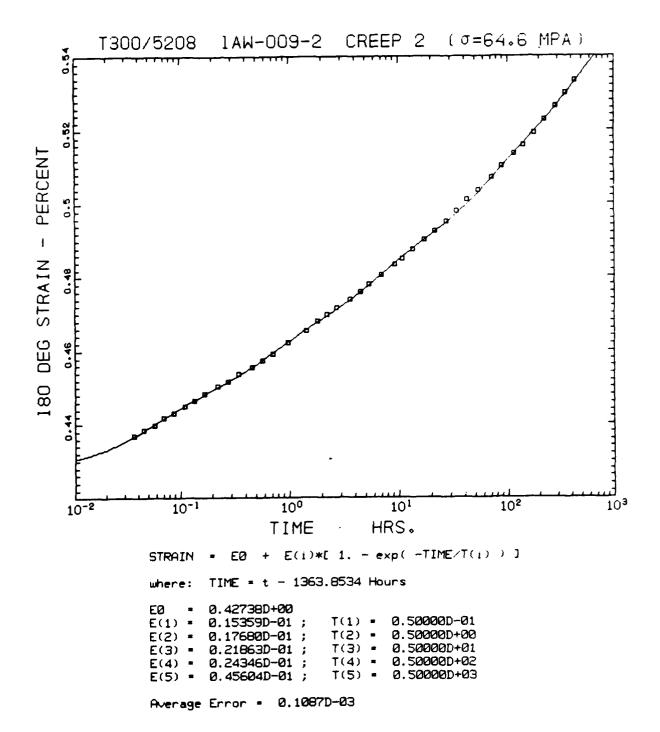


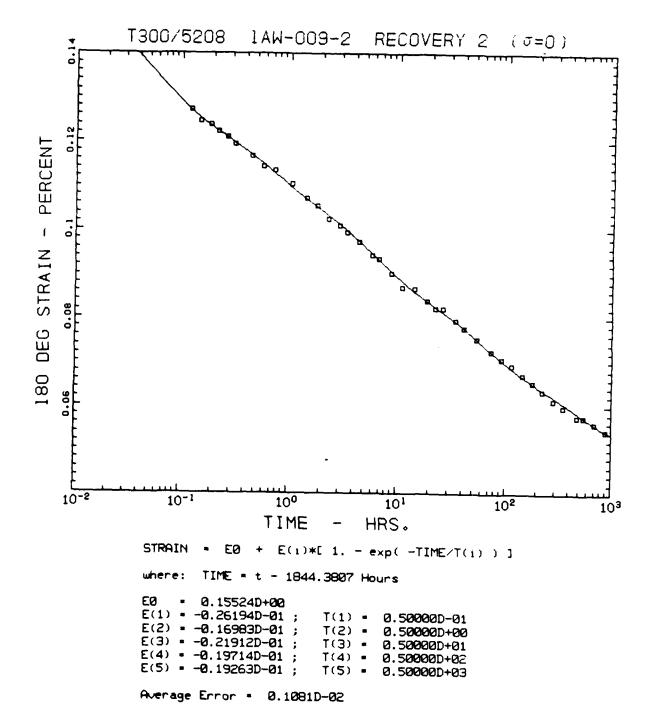


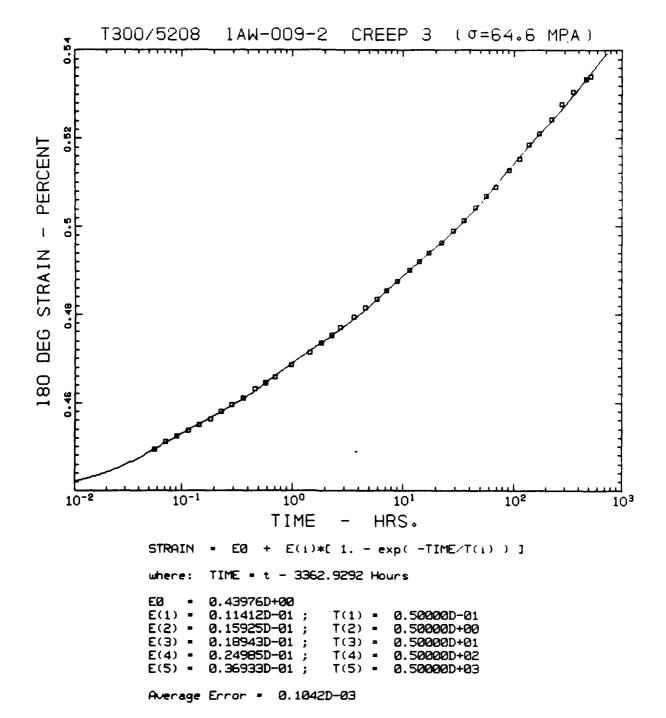


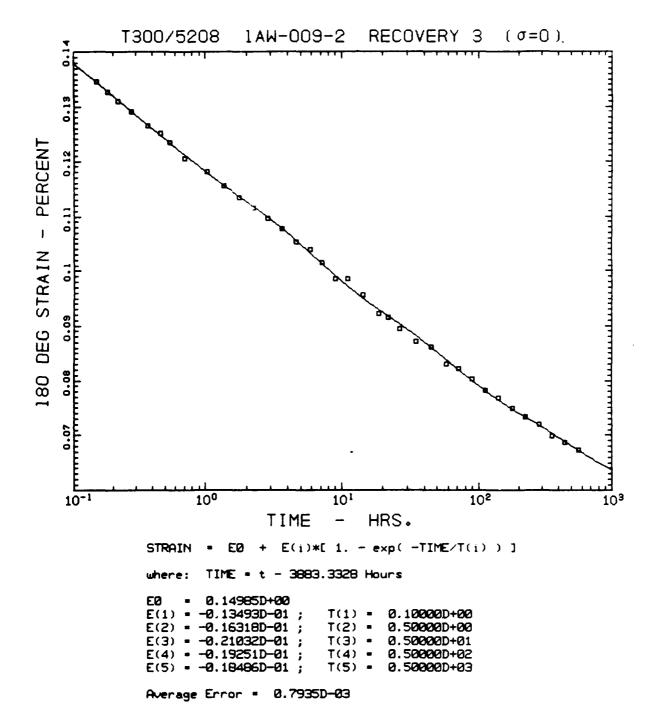


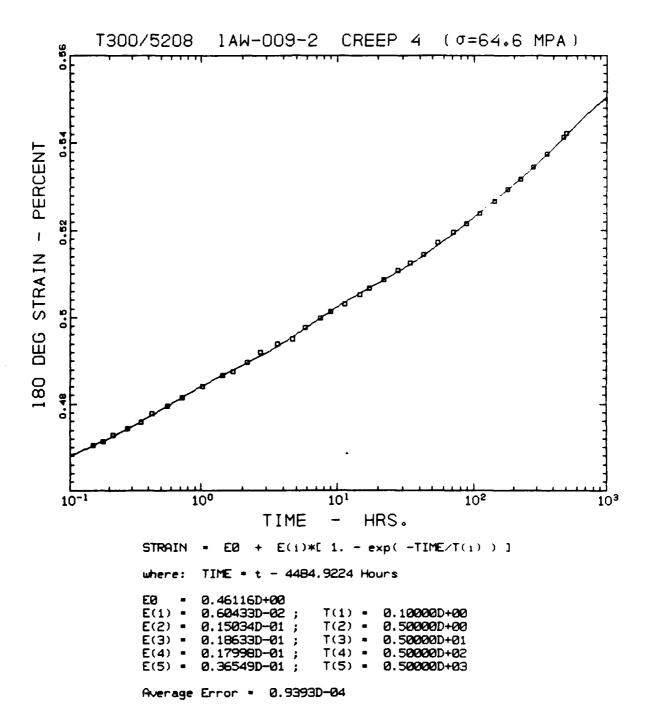


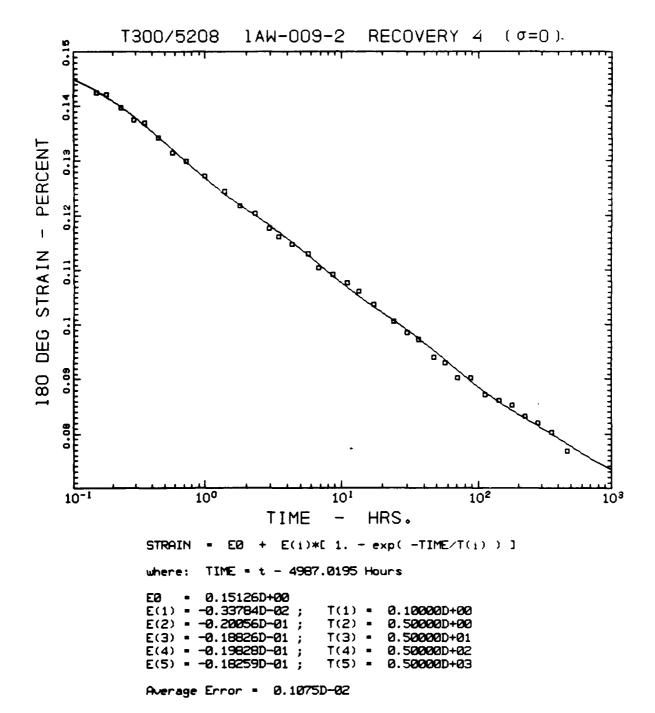


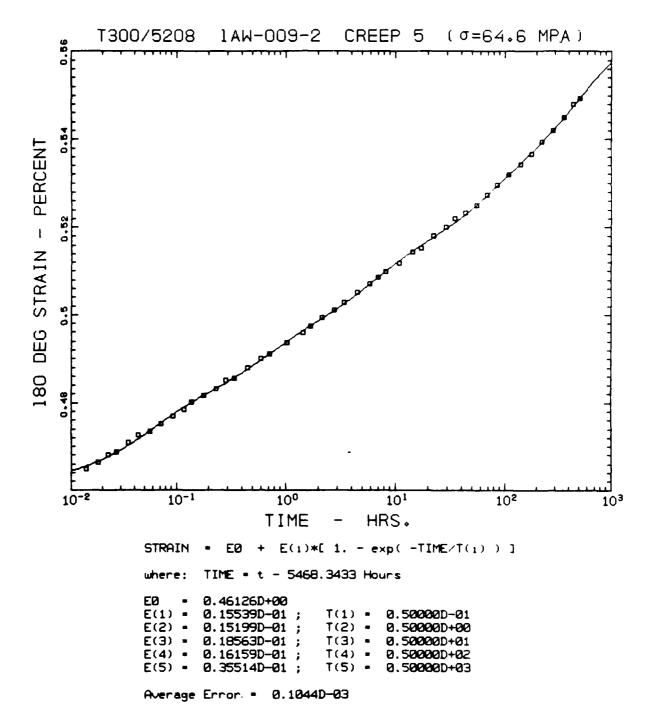


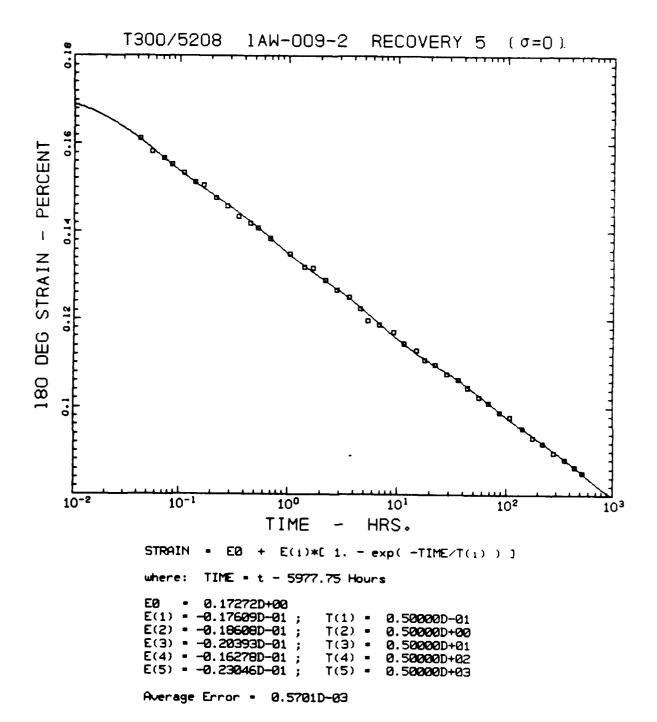




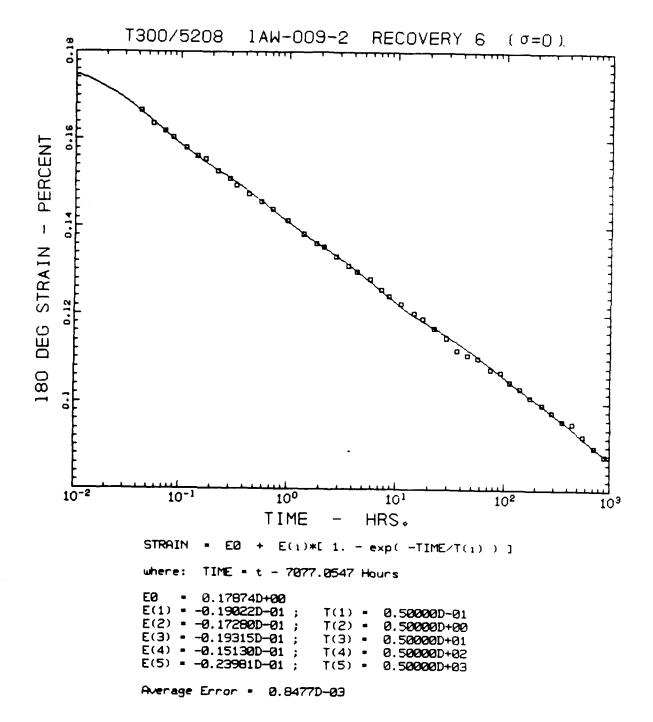




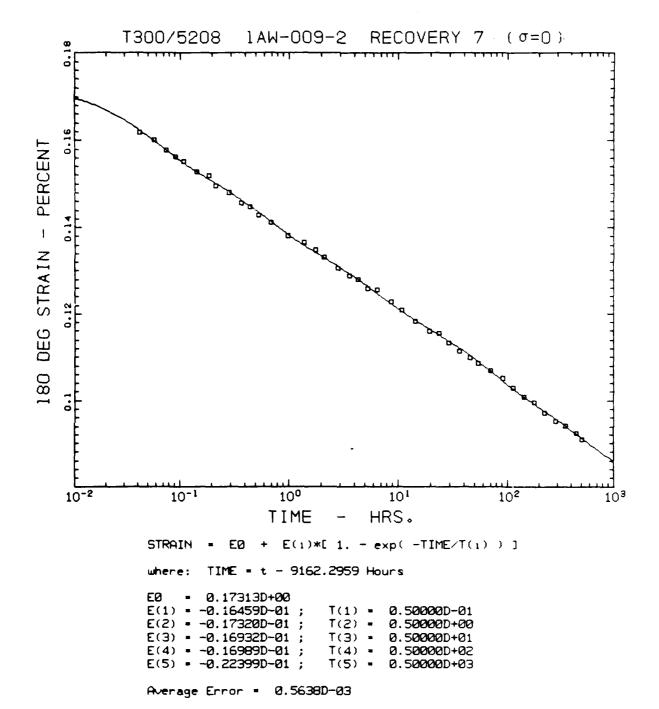


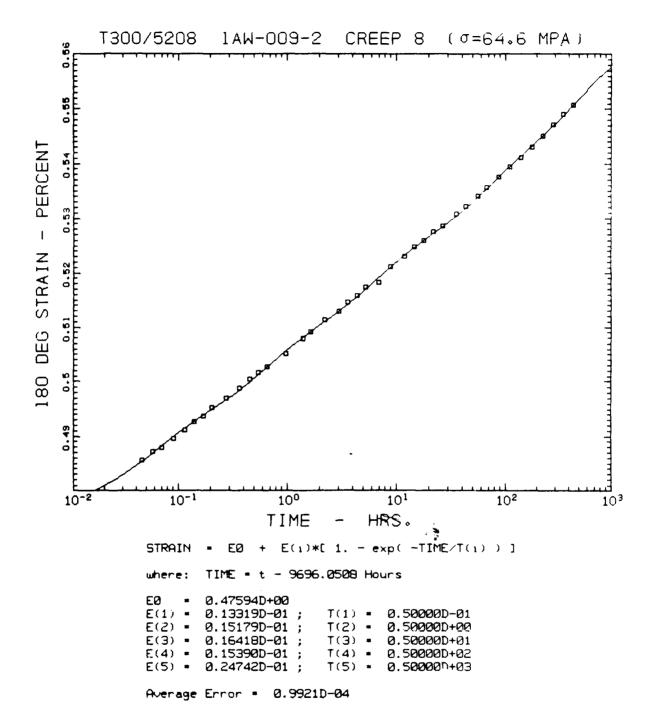


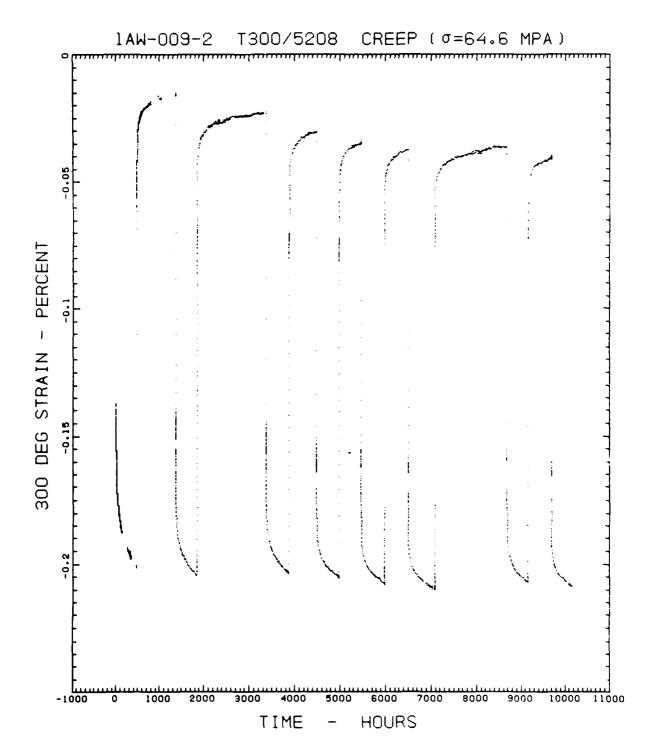
```
1AW-009-2 CREEP 6
          T300/5208
                                                                  (\sigma=64.6 \text{ MPA})
180 DEG STRAIN - PERCENT
                                       10°
     10-2
                     10-1
                                                         101
                                                                          10<sup>2</sup>
                                                                                           10<sup>3</sup>
                                                     HRS.
                                     TIME
                              EØ + E(i)*[1. - exp(-TIME/T(i))]
                  STRAIN
                           TIME * t - 6499.5635 Hours
                  where:
                           0.46996D+00
0.13989D-01;
                  EØ
                  E(1) =
                                               T(1) =
                                                        0.50000D-01
                           0.16070D-01;
                                               T(2) =
                  E(2) •
                                                        0.50000D+00
                           0.17618D-01;
                  E(3) -
                                               T(3) -
                                                        0.50000D+01
                           0.17102D-01;
0.30158D-01;
                  E(4) =
E(5) =
                                                        0.50000D+02
0.50000D+03
                                               T(4) =
                                               T(5) •
                  Average Error = 0.9369D-04
```

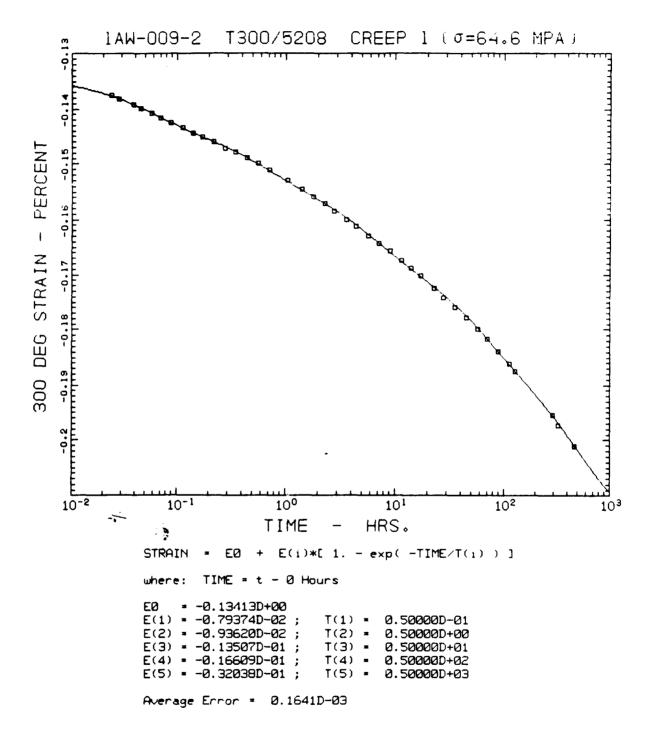


```
T300/5208
                              1AW-009-2
                                                  CREEP 7
                                                                  \{\sigma=64.6 \text{ MPA}\}
- PERCENT
180 DEG STRAIN
     10-2
                                        10°
                                                                                            10<sup>3</sup>
                      10-1
                                                         101
                                                                           10<sup>2</sup>
                                     TIME
                                                      HRS.
                  STRAIN
                            = E0 + E(i)*[ 1. - exp( ~TIME/T(i) ) ]
                            TIME • t - 8682.5654 Hours
                  where:
                            0.46614D+00
                  E(1) =
                           0.13148D-01;
                                               T(1) =
                                                         0.50000D-01
                  E(2) .
                           0.15164D-01;
                                               T(2) -
                                                         0.50000D+00
                  E(3) = 0.18878D-01;
E(4) = 0.17219D-01;
E(5) = 0.33620D-01;
                                                         0.50000D+01
0.50000D+02
                                                T(3) =
                                                T(4) =
                                                T(5) -
                                                         0.50000D+03
                  Average Error = 0.9344D-04
```



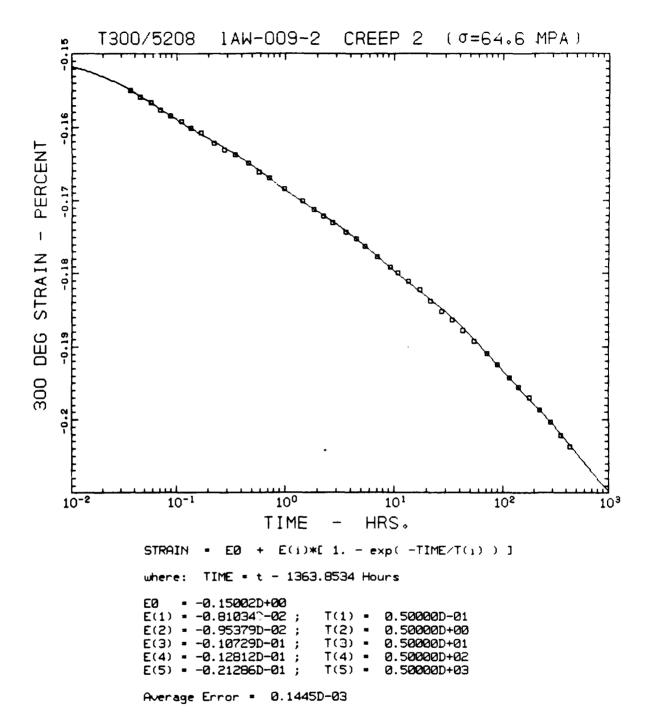


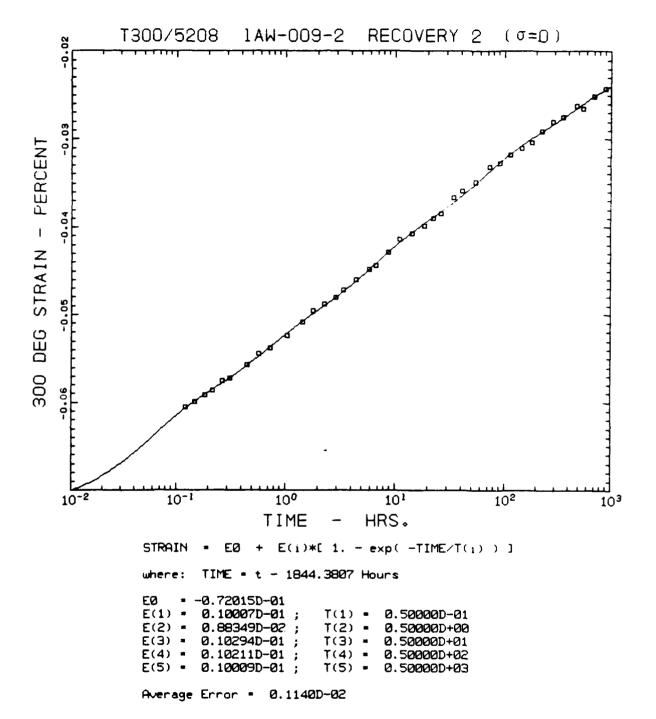


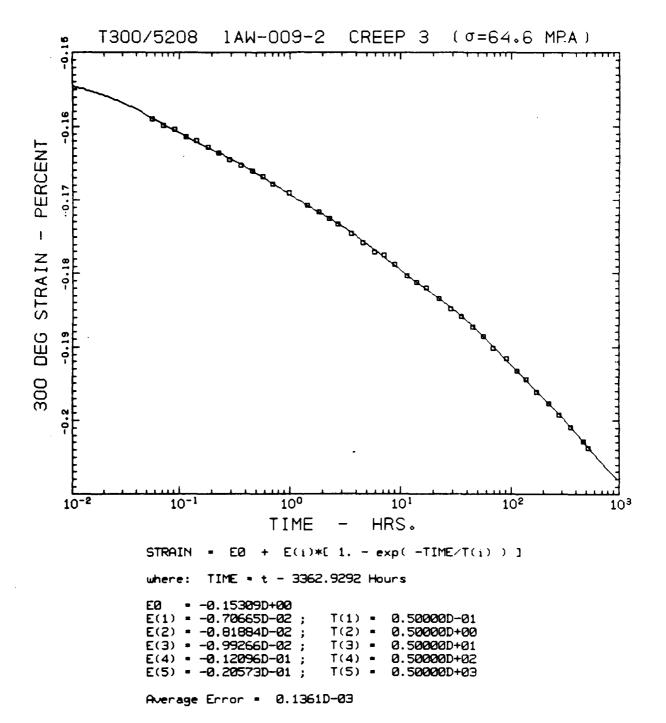


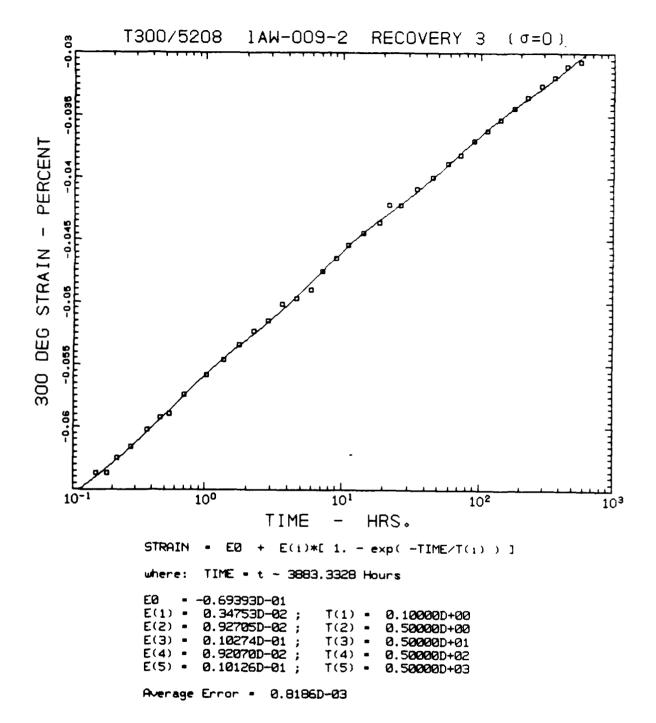
```
T300/5208
                              1AW-009-2 RECOVERY 1 ( 0=0 )
DEG
300
                                    10°
                                                                     10<sup>2</sup>
                    10-1
                                                    10<sup>1</sup>
                                                                                     10<sup>3</sup>
    10-2
                                  TIME
                                                 HRS.
                        = E0 + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                STRAIN
                         TIME = t - 480.0048 Hours
                      - -0.65422D-01
                         0.10036D-01;
                E(1) =
                                           T(1) =
                                                    0.50000D-01
                E(2) =
                         0.10033D-01;
                                           T(2) =
                                                    0.50000D+00
                         0.11783D-01;
0.99863D-02;
0.10179D-01;
                                           T(3) =
                                                    0.50000D+01
                E(3) =
                E(4) =
                                           T(4) =
                                                    0.50000D+02
                                           T(5) =
                E(5) =
                                                    0.50000D+03
```

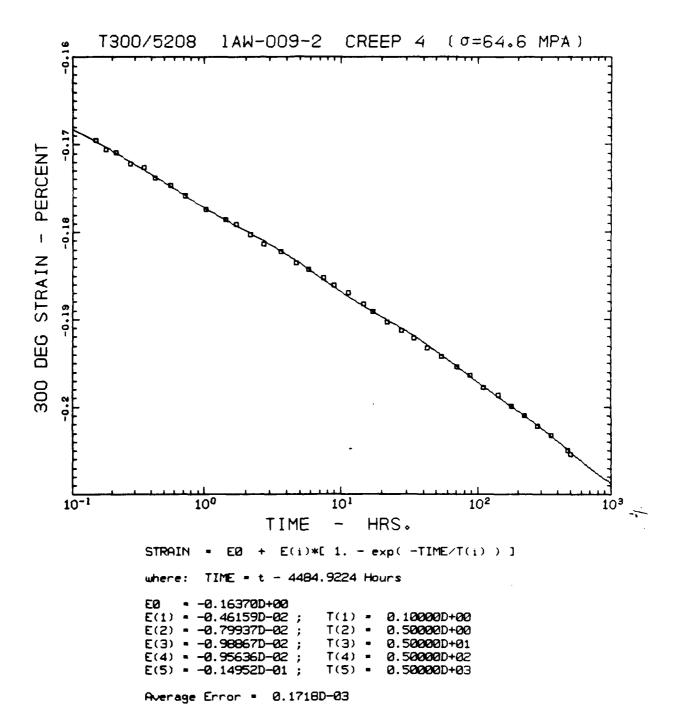
Average Error = 0.1389D-02

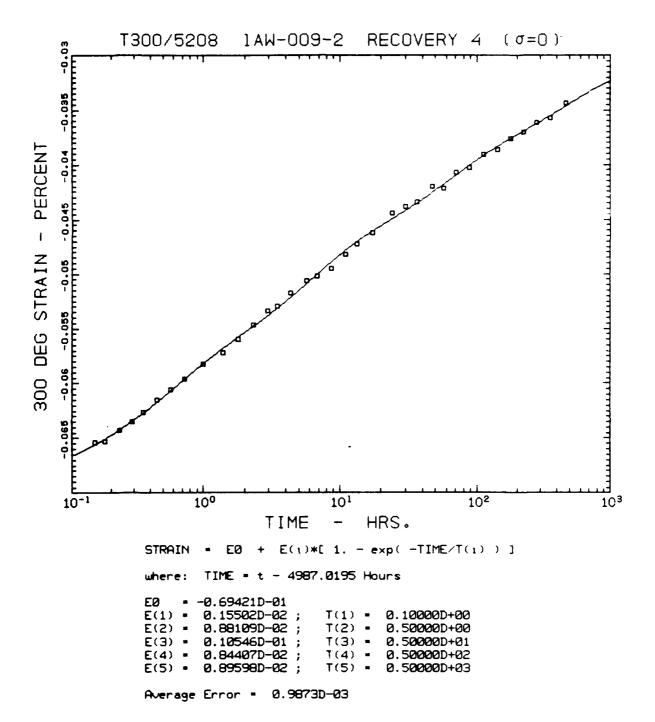




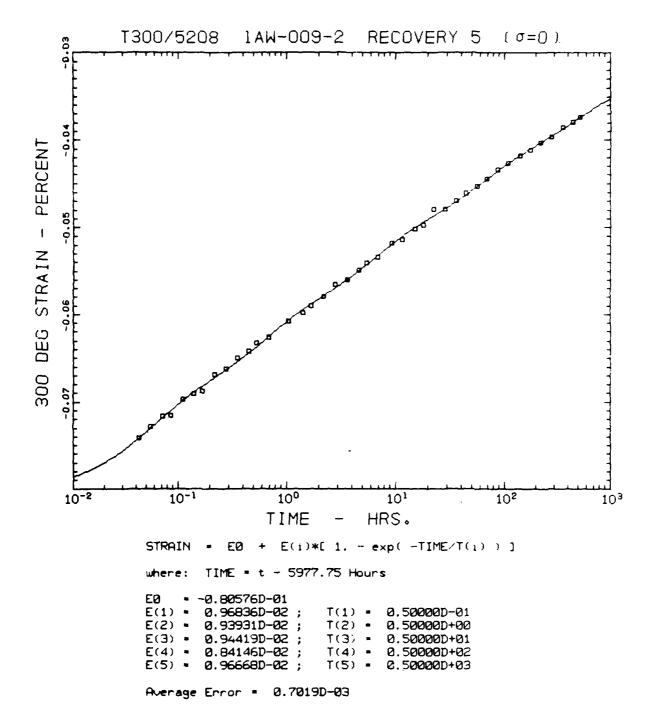


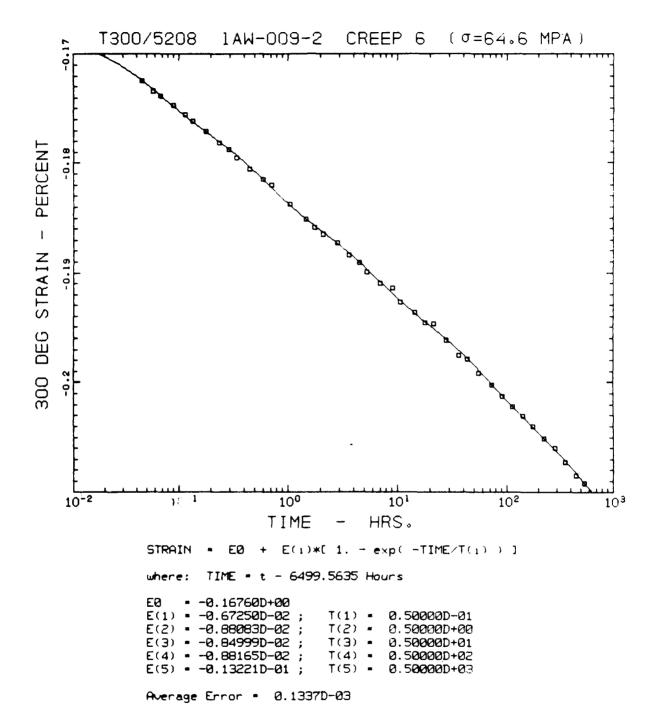


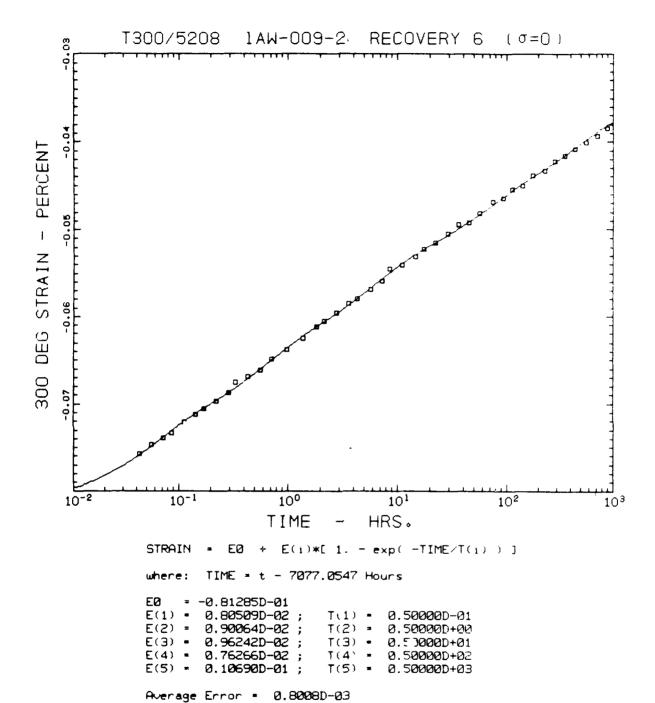




```
T300/5208
                             1AW-009-2 CREEP 5
                                                                (\sigma=64.6 \text{ MPA})
- PERCENT
DEG STRAIN
                                       10°
    10-5
                     10-1
                                                        10<sup>1</sup>
                                                                          10<sup>2</sup>
                                                     HRS.
                                     TIME
                               EØ + E(i)*[ 1. - exp(-TIME/T(1)) ]
                           TIME = t - 5468.3433 Hours
                  where:
                       - -0.16456D+00
                  E(1) = -0.78094D-02;
                                               T(1) =
                                                        0.50000D-01
                  E(2) = -0.87039D-02;
                                               T(2) =
                                                        0.50000D+00
                 E(3) = -0.88230D-02;
E(4) = -0.85232D-02;
E(5) = -0.14076D-01;
                                                        0.50000D+01
0.50000D+02
                                               T(3) =
                                               T(4) -
                                                        0.50000D+03
                                               T($) =
                  Average Error = 0.1720D-03
```







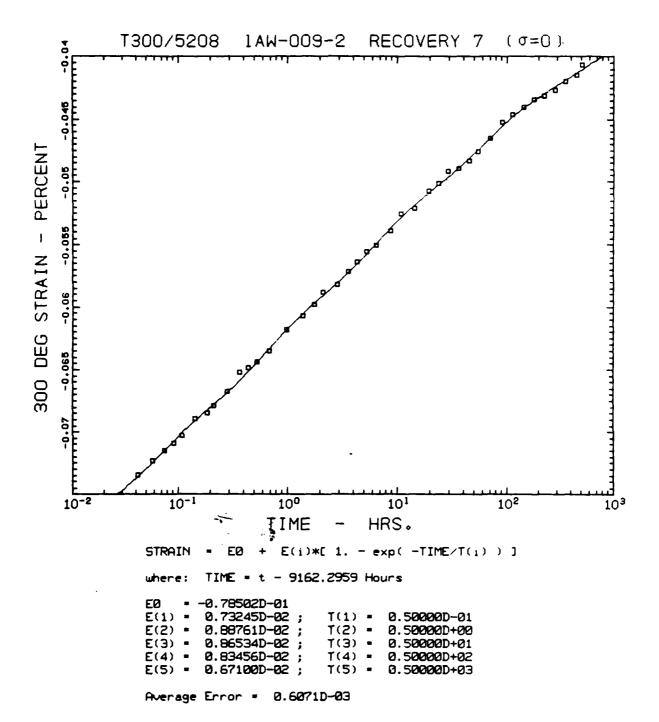
```
1AW-009-2
            T300/5208
                                                           CREEP 7 (\sigma=64.6 MPA)
PERCENT
300 DEG STRAIN
      10-2
                                               10°
                                                                                                            10<sup>3</sup>
                          10^{-1}
                                                                   10<sup>1</sup>
                                                                                        10<sup>2</sup>
                                                               HRS.
                                            TIME
                                             E(i)*[1. - exp(-TIME/T(i))]
                     STRAIN
                                 TIME = t - 8682.5654 Hours
                            - -0.16467D+00
                     E0
                     E(1) = -0.64096D-02;

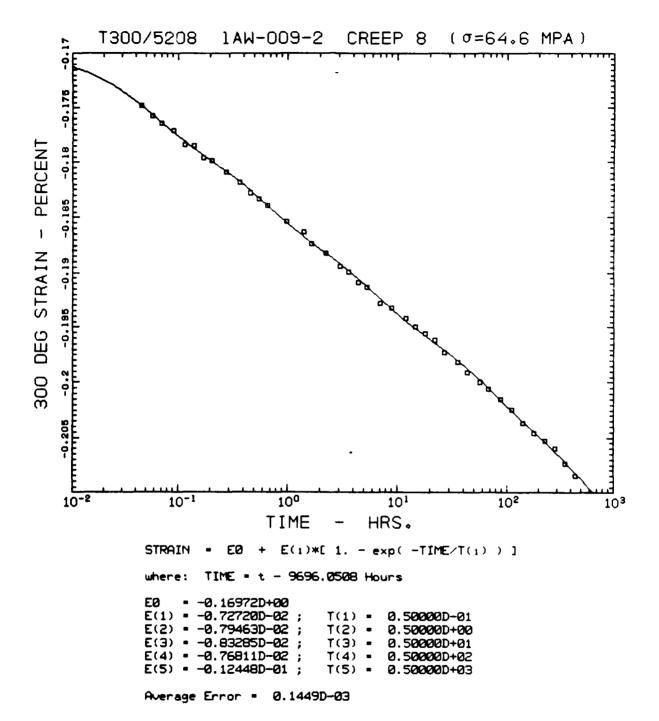
E(2) = -0.69051D-02;

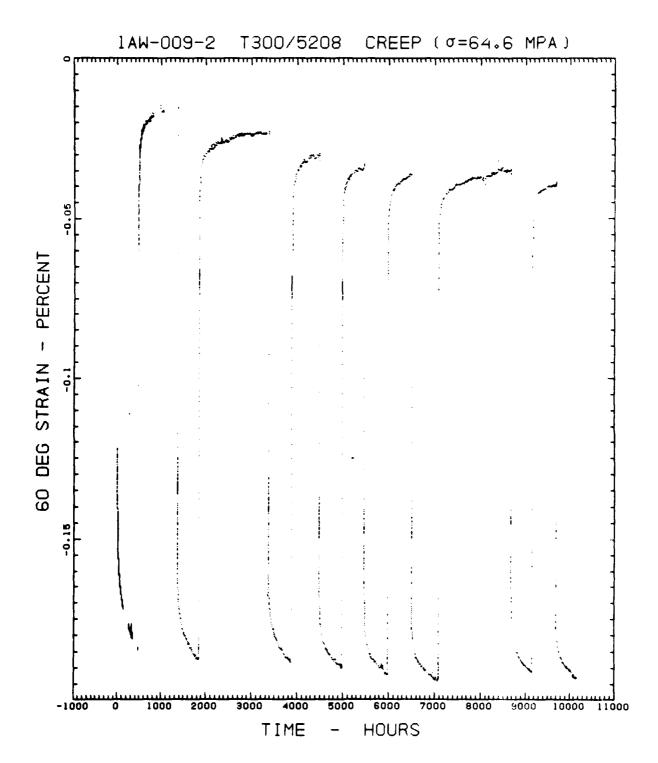
E(3) = -0.84157D-02;

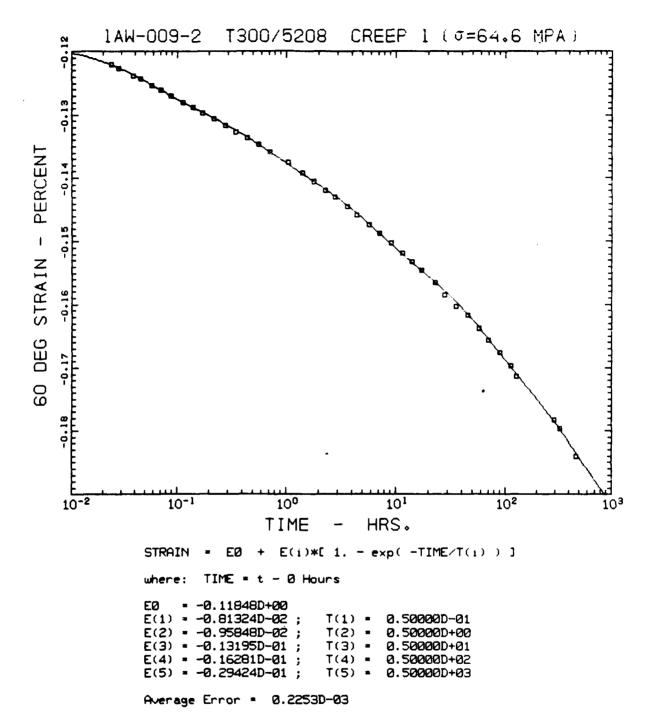
E(4) = -0.94369D-02;

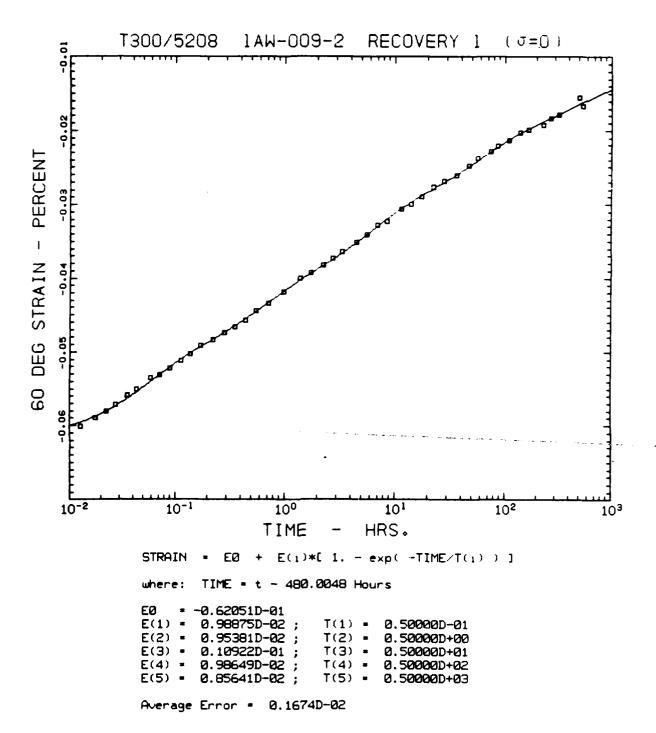
E(5) = -0.14909D-01;
                                                        T(1) =
                                                                   0.50000D-01
                                                        T(2) =
                                                                   0.50000D+00
                                                        E (E)T
                                                                   0.50000D+01
                                                                   0.50000D+02
0.50000D+03
                                                        T(4) =
                                                        T(5) =
                     Average Error = 0.1501D-03
```

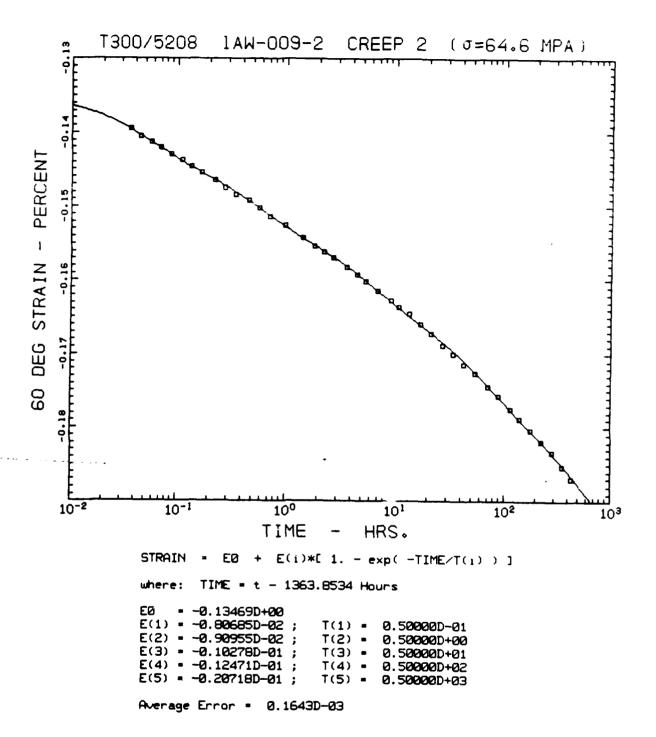


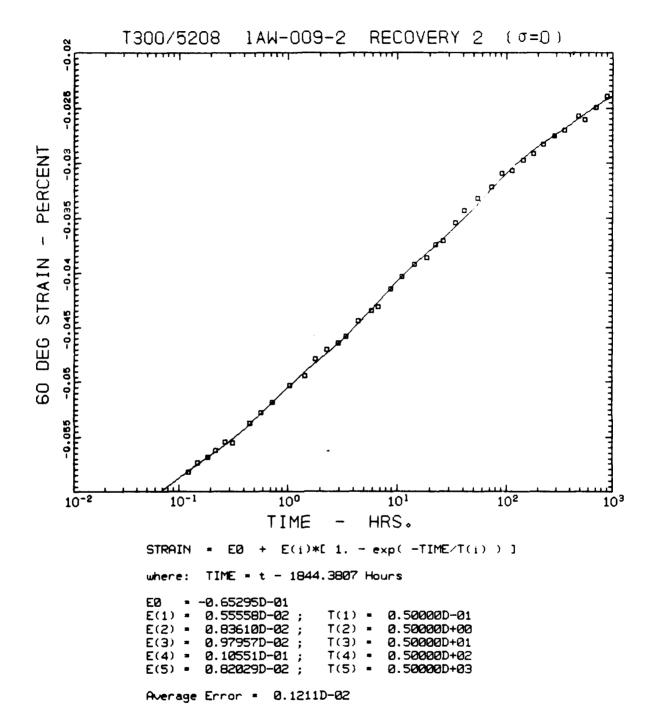


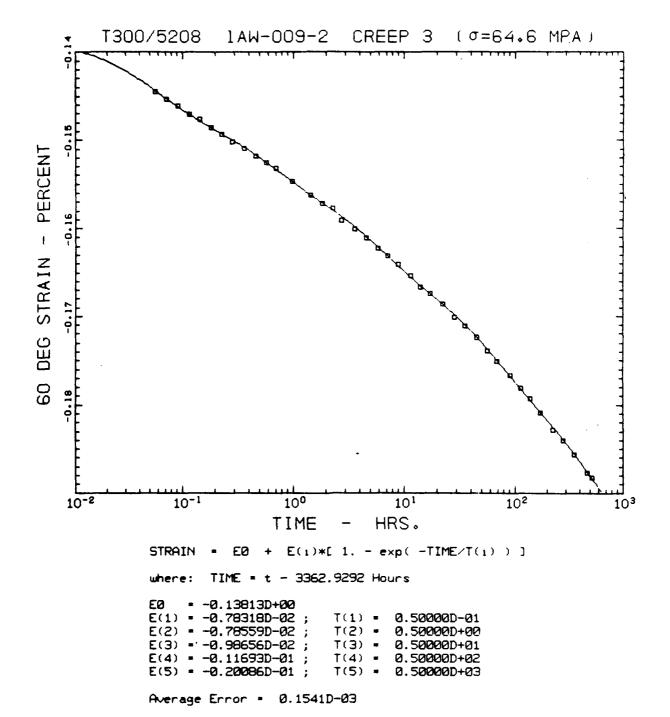


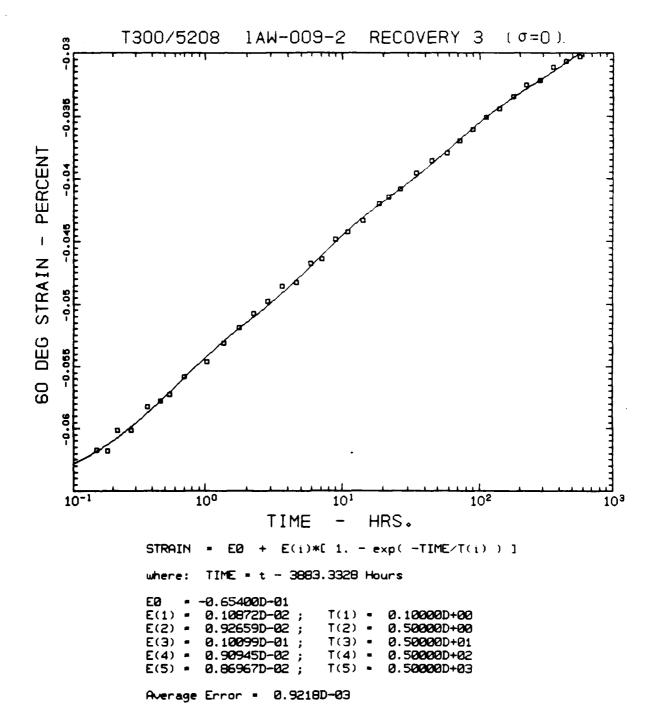


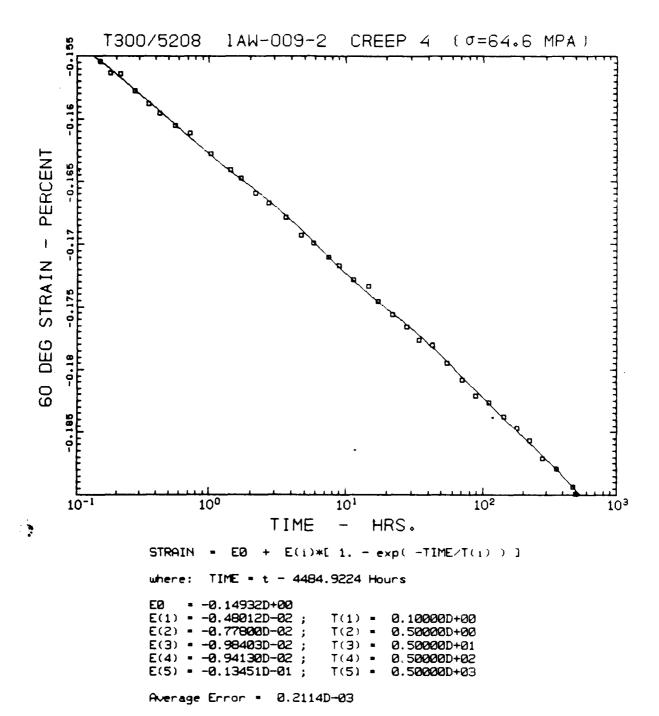


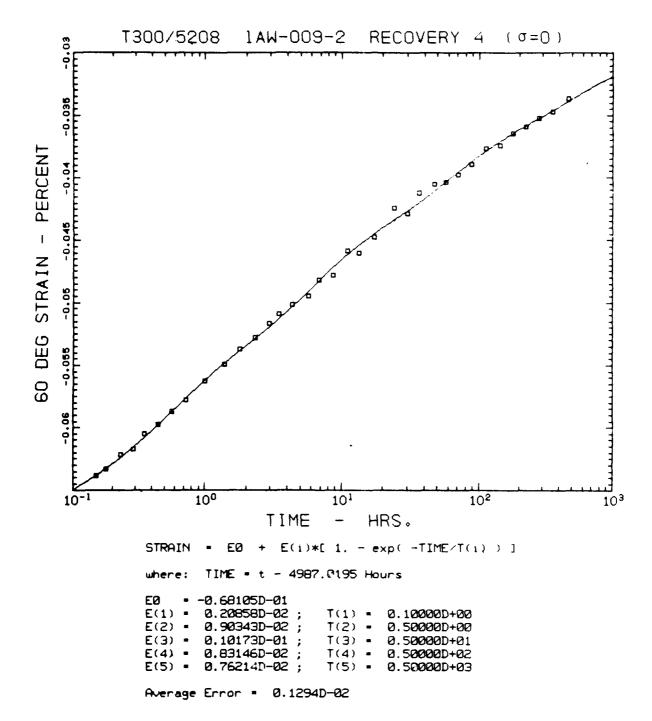










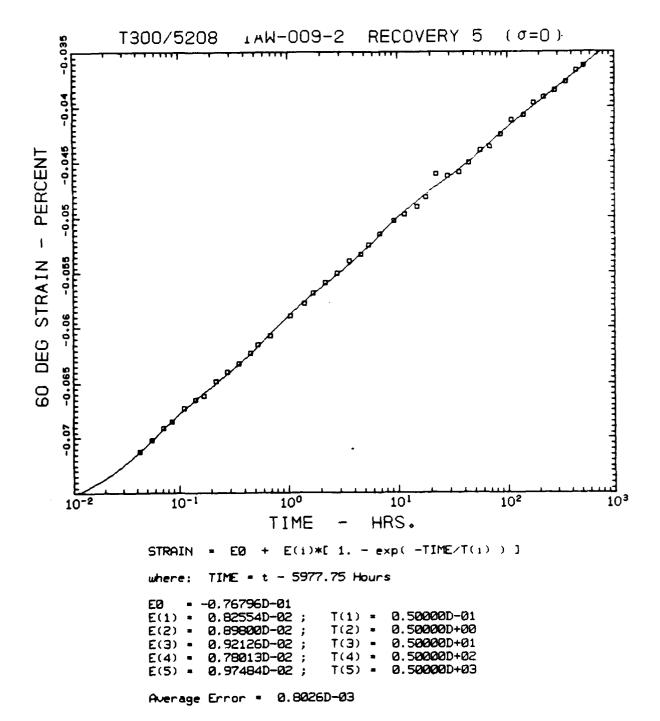


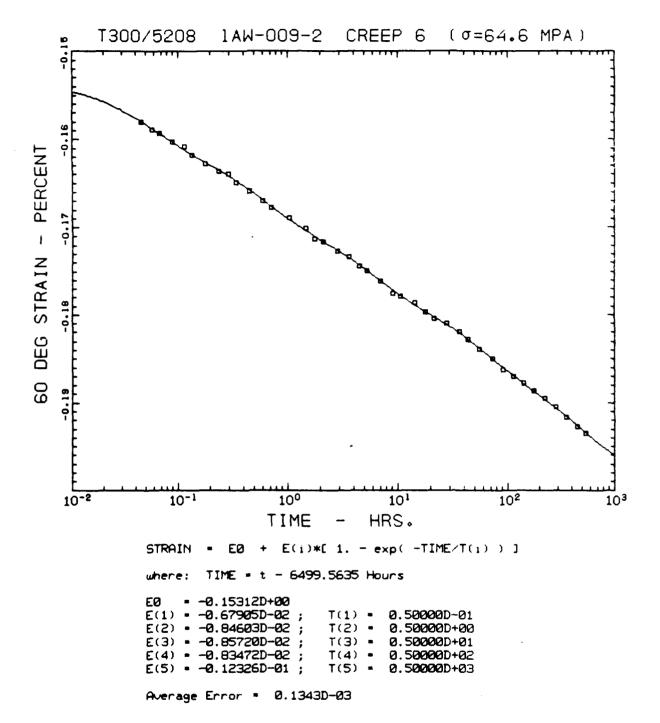
```
T300/5208
                               1AW-009-2
                                                   CREEP 5
                                                                   ( \sigma = 64.6 MPA )
PERCENT
STRAIN
DEG
                                        10°
     10-2
                      10-1
                                                          10<sup>1</sup>
                                                                             10<sup>2</sup>
                                                                                               10<sup>3</sup>
                                      TIME
                                                       HRS.
                  STRAIN = EØ + E(i)*[ 1. - exp(-TIME/T(1)) ]
                  where: TIME = t - 5468.3433 Hours
                  Ε0
                        • -0.15038D+00
                  E(1) = -0.77045D-02;

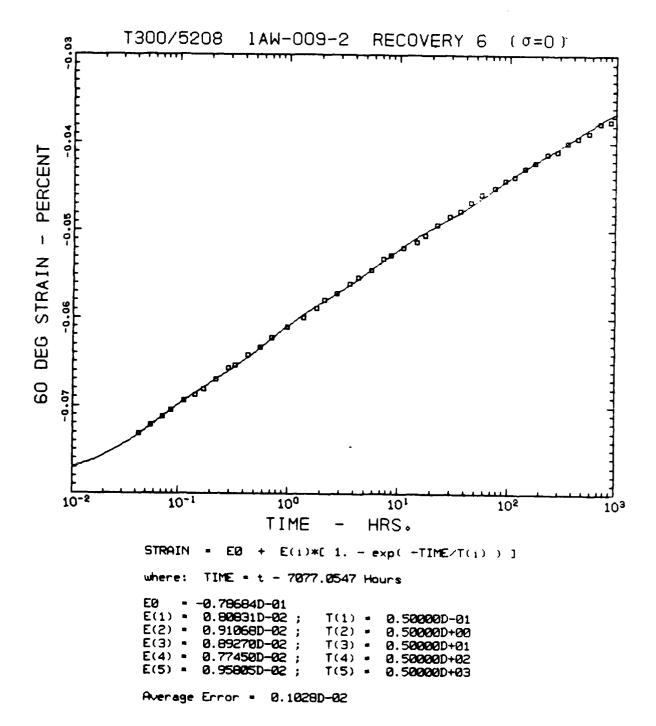
E(2) = -0.84626D-02;
                                                          0.50000D-01
0.50000D+00
                                                 T(1) =
                                                T(2) •
T(3) •
                  E(3) = -0.89305D-02;

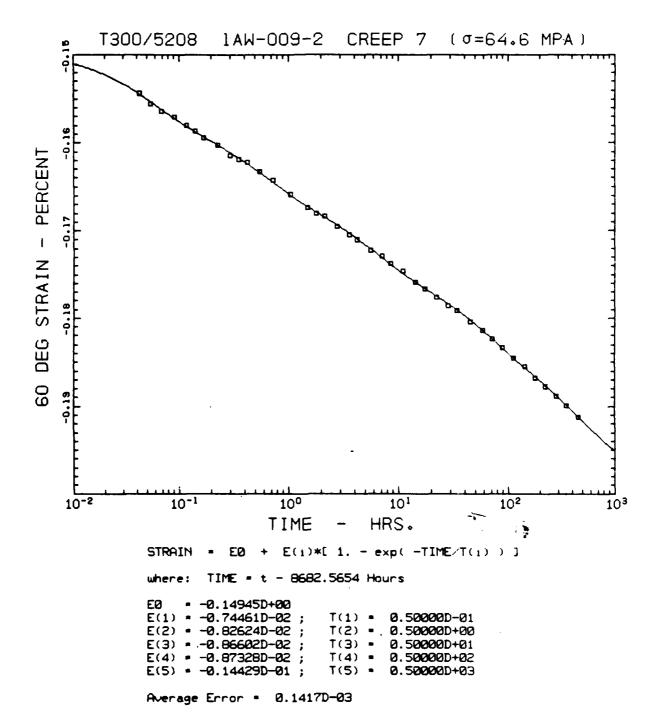
E(4) = -0.79133D-02;
                                                          0.50000D+01
                                                T(4) =
                                                          0.50000D+02
                                                 T(5) = 0.50000D+03
                  E(5) = -0.13137D-01;
```

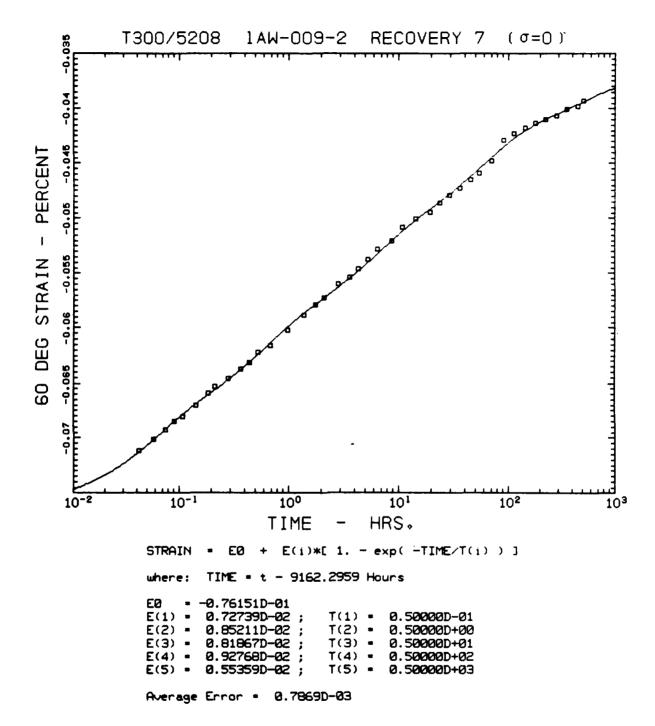
Average Error = 0.2057D-03

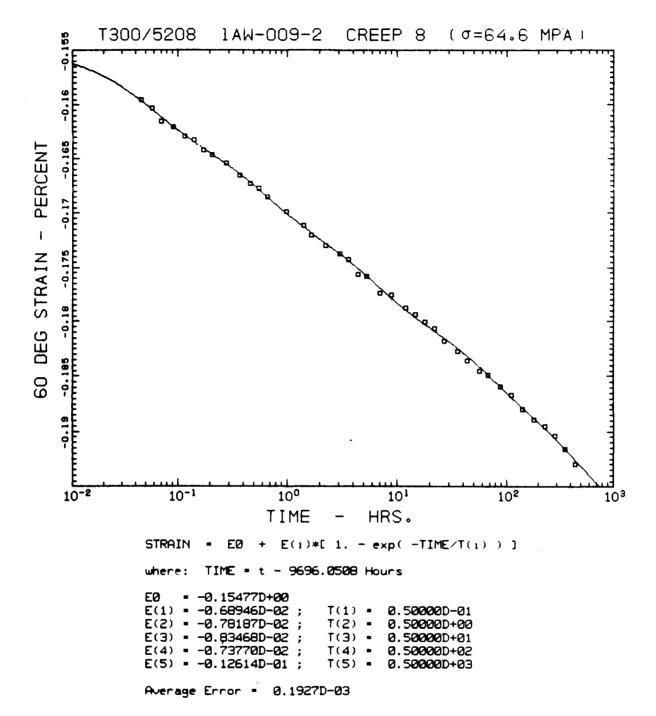


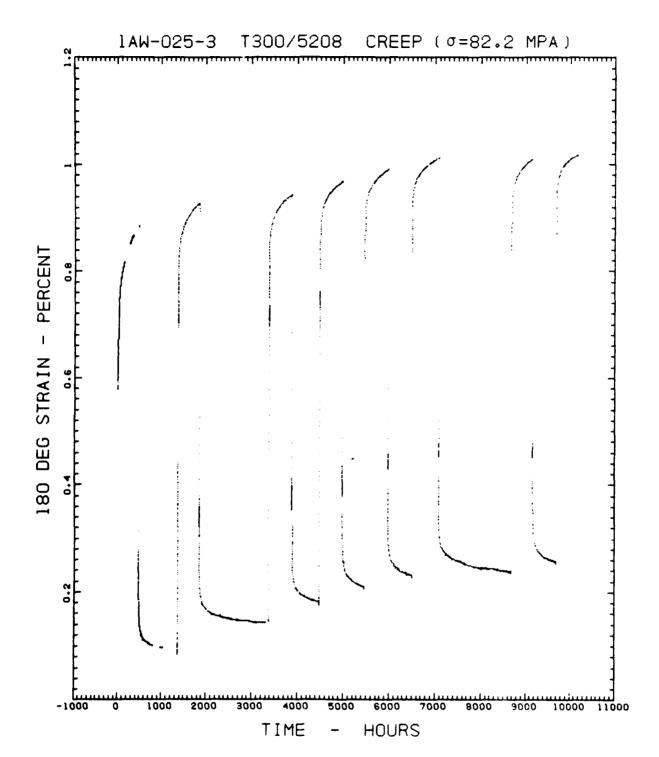


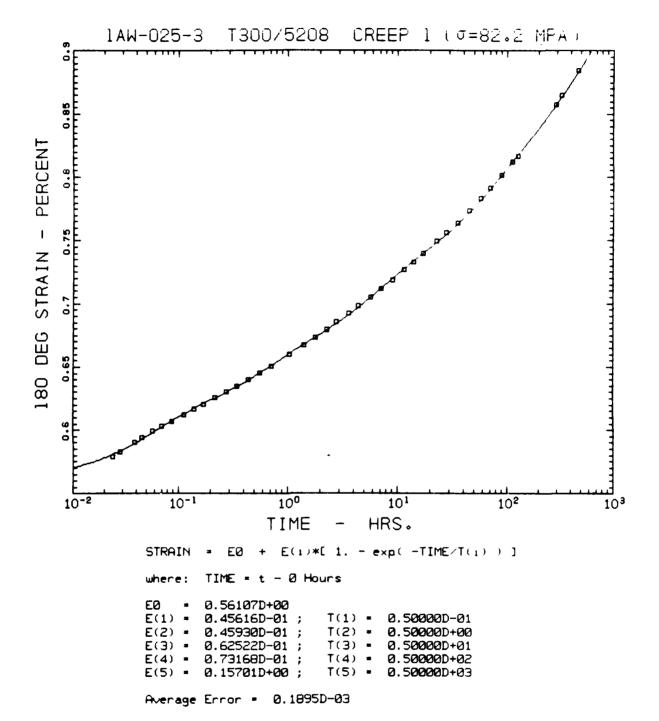


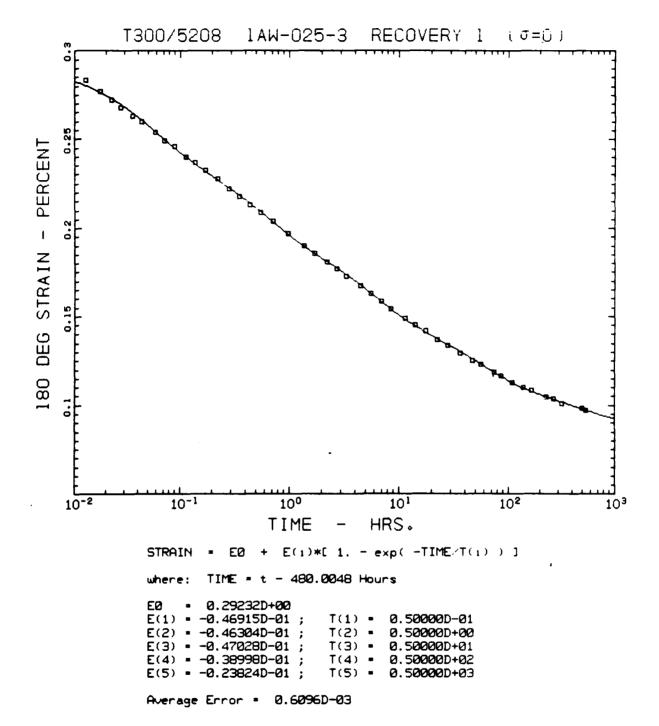


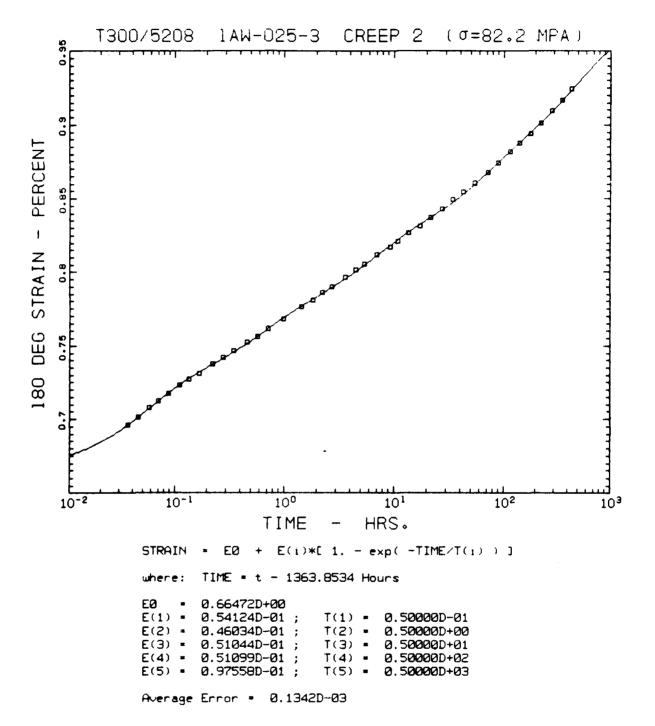


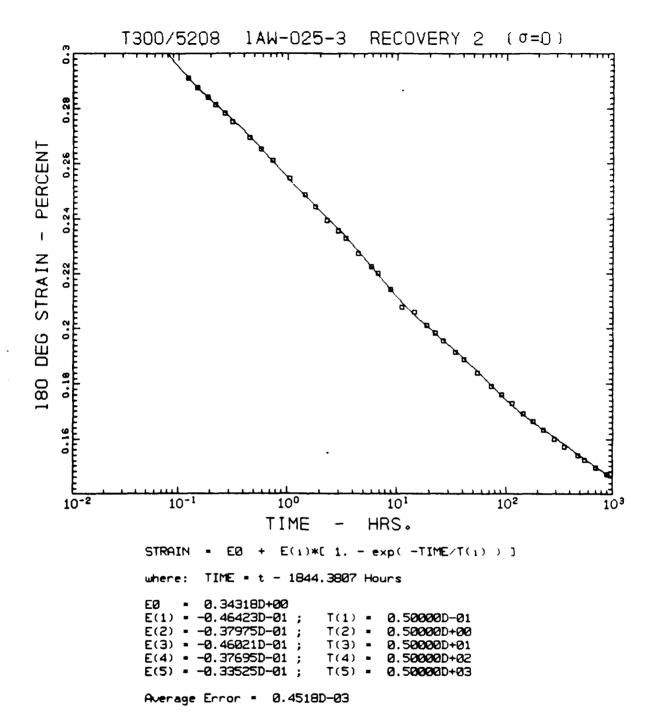


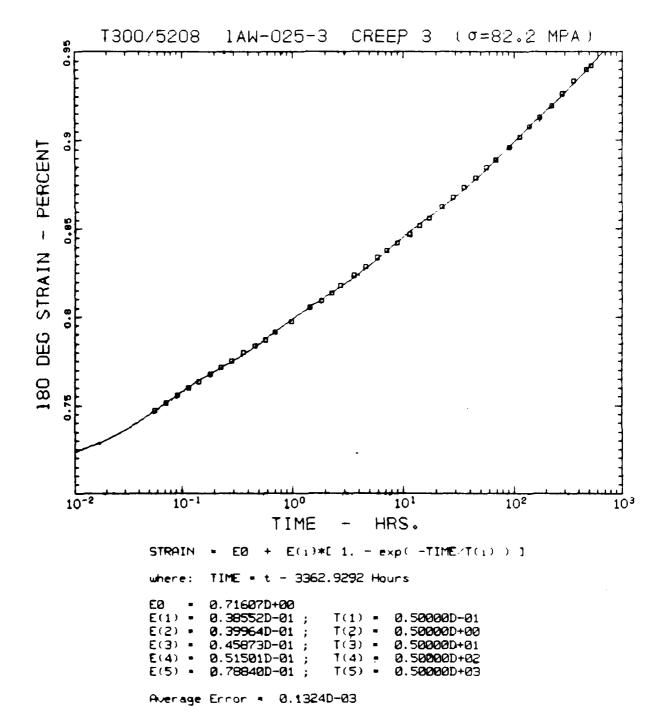


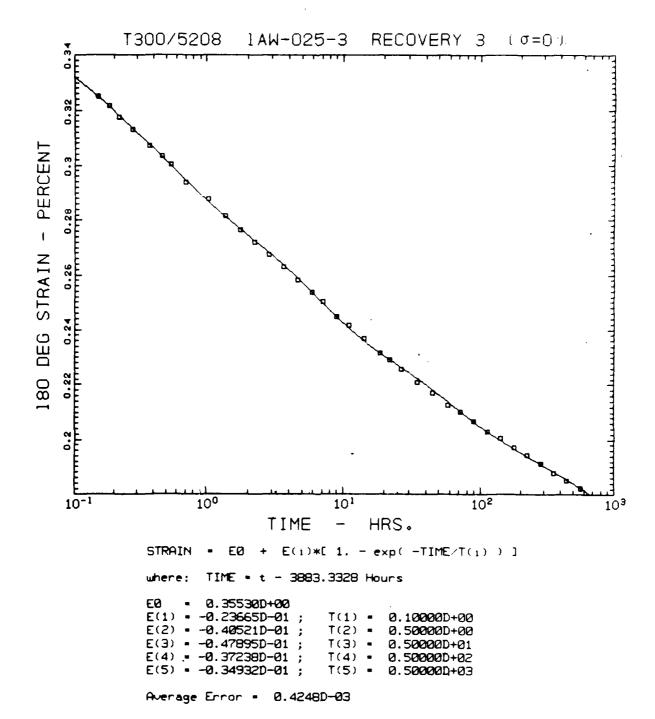






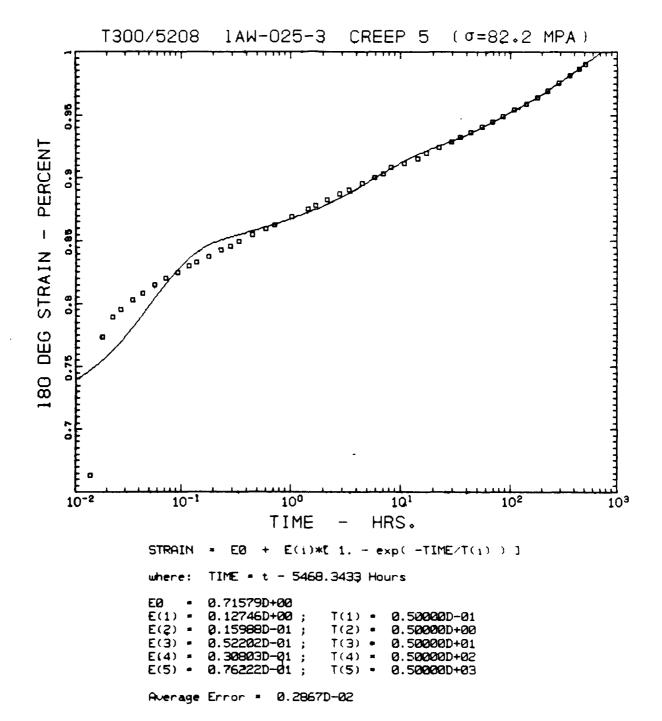






```
T300/5208
                            1AW-025-3
                                                CREEP 4 (\sigma=82.2 MPA)
PERCENT
180 DEG STRAIN
                                              101
                                                                                        10<sup>3</sup>
                         10°
                                                                    10<sup>2</sup>
    10-1
                                    TIME
                                              - HRS.
                                  + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                 STRAIN
                            EØ
                 where:
                          TIME • t - 4484.9224 Hours
                          0.78087D+00
                 EØ
                 E(1) =
                          0.15379D-01;
                                                       0.10000D+00
                                             T(1) =
                 E(2) -
                          0.40123D-01;
                                             T(2) =
                                                       0.50000D+00
                          0.43334D-01;
0.41706D-01;
0.72081D-01;
                                                       0.50000D+01
0.50000D+02
                 E(3) =
                                             T(3) =
                 E(4) =
E(5) =
                                              T(4) =
                                                       0.50000D+03
                                             T(5) =
                 Average Error = 0.9953D-04
```

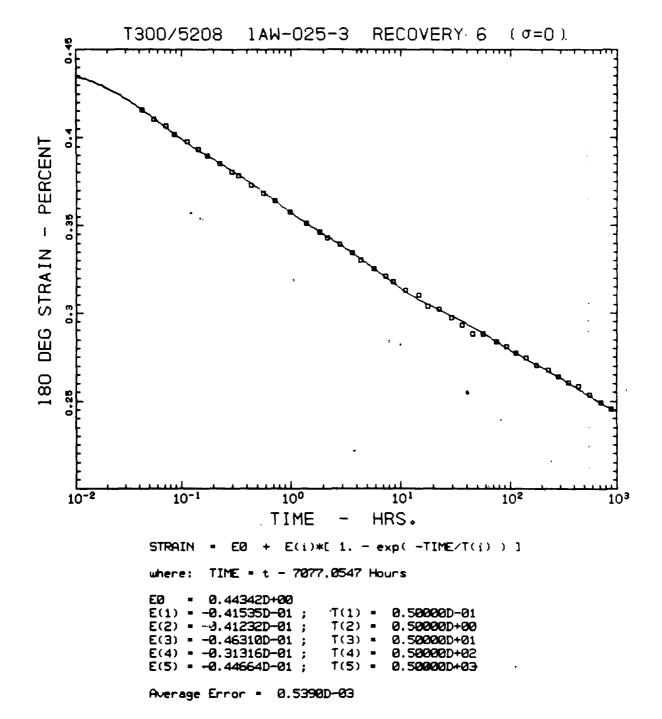
```
1AW-025-3
                                                RECOVERY 4 (\sigma=0).
            T300/5208
PERCENT
STRAIN
DEG
                       10°
                                           101
                                                               10<sup>2</sup>
                                                                                  10<sup>3</sup>
    10^{-1}
                                 TIME
                                                HRS.
                                         _
                                + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                where:
                        TIME = t - 4987.0195 Hours
                E0 = 0.37425D+00
E(1) = -0.15786D-01;
                                          T(1) =
                                                   0.10000D+00
                E(2) = -0.44251D-01;
                                          T(2) =
                                                   0.50000D+00
                E(3) • -0.43230D-01;
                                                   0.50000D+01
                                          T(3) =
                E(4) = -0.38792D-01;
                                          T(4) =
                                                   0.50000D+02
                                          T(5) -
                                                   0.50000D+03
                E(5) = -0.35801D-01;
                Average Error = 0.6329D-03
```

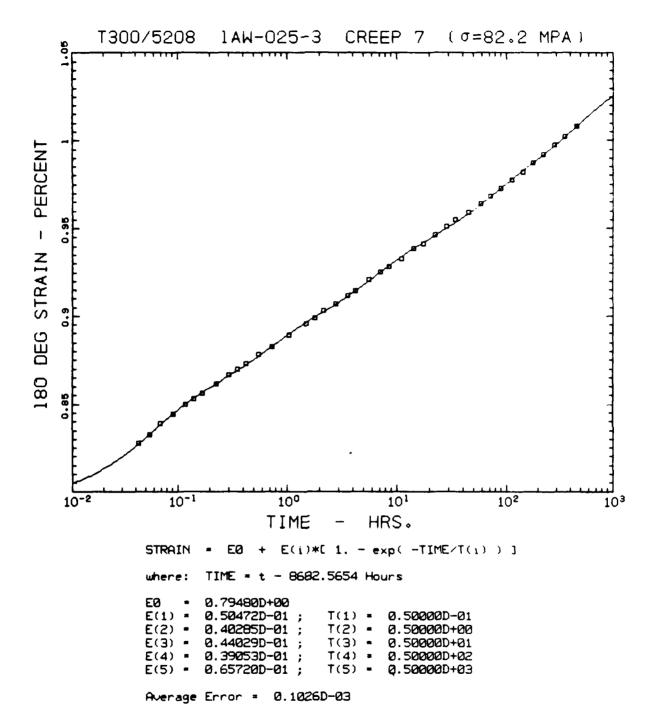


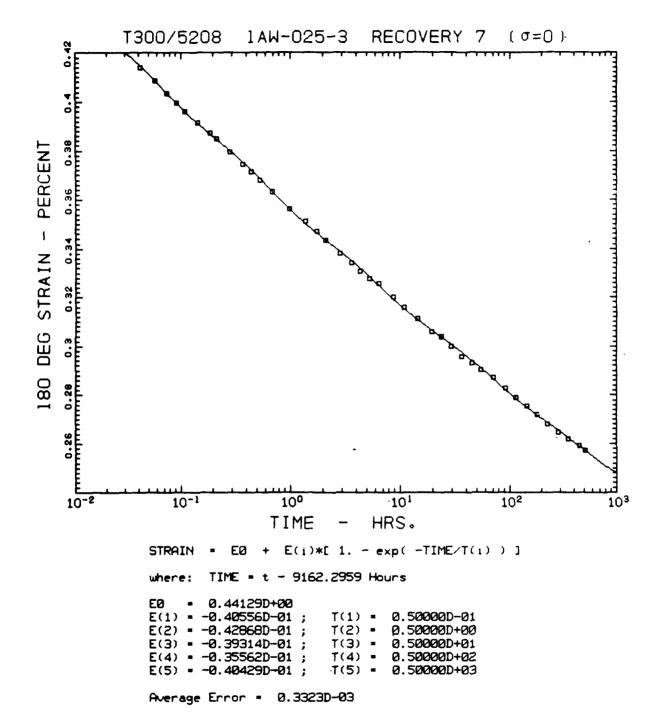
```
T300/5208
                                1AW-025-3 RECOVERY 5 (\sigma=0)
PERCENT
180 DEG STRAIN
                                     10°
    10-2
                                                      101
                                                                       10<sup>2</sup>
                    10^{-1}
                                                                                        10<sup>3</sup>
                                   TIME
                                                   HRS.
                             EØ + E(i)*[1. - exp(-TIME/T(i))]
                 STRAIN
                          TIME = t - 5977.75 Hours
                      • 0.42246D+00
                 E(1) = -0.40459D-01;
                                             T(1) =
                                                      0.50000D-01
                 E(2) = -0.43719D-01;
                                             T(2) -
                                                      0.50000D+00
                 E(3) = -0.45007D-01.;
                                                      0.50000D+01
                                             T(3) =
                                             T(4) = 0.50000D+02
T(5) = 0.50000D+03
                 E(4) = -0.35408D-01;

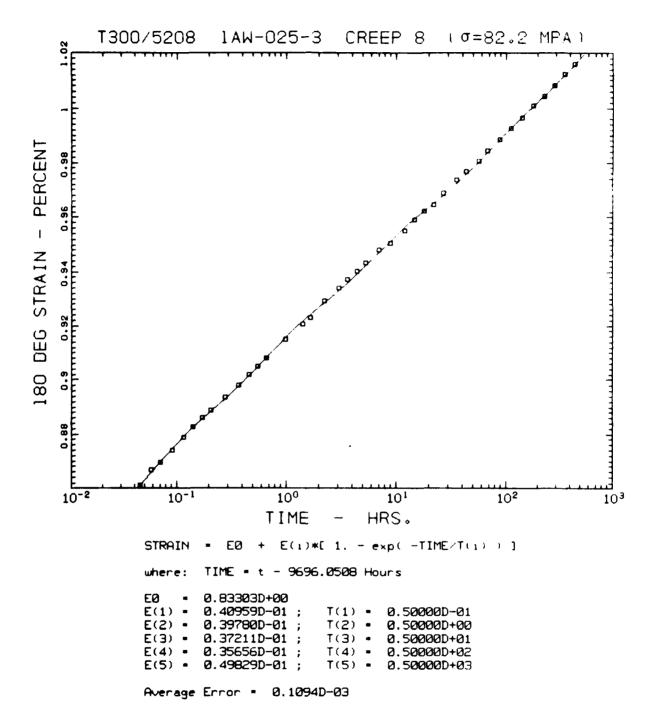
E(5) = -0.41813D-01;
                 Average Error = 0.4854D-03
```

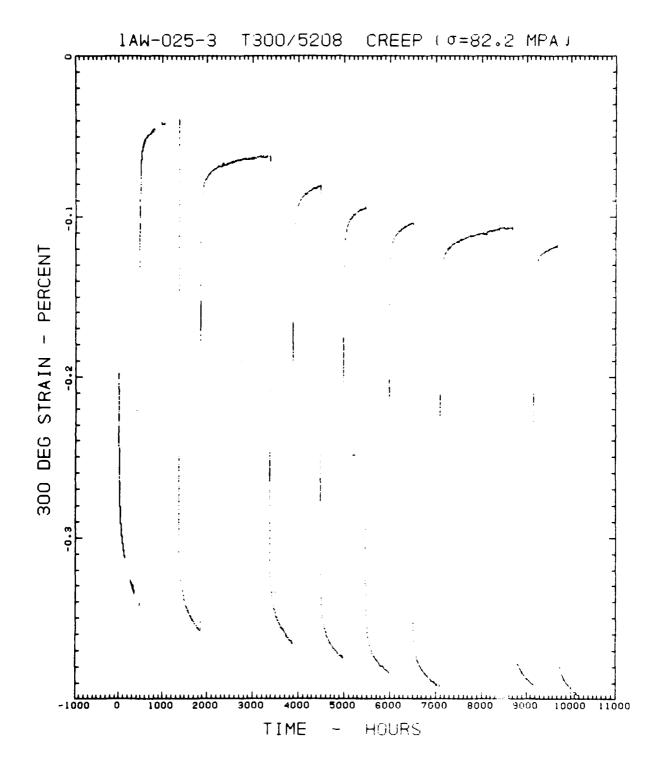
```
(\sigma = 82.2 \text{ MPA})
          T300/5208
                             1AW-025-3
                                                 CREEP 6
180 DEG STRAIN - PERCENT
     10-2
                      10-1
                                       10<sup>0</sup>
                                                         10<sup>1</sup>
                                                                          10<sup>2</sup>
                                                                                           10<sup>3</sup>
                                                     HRS.
                                     TIME
                                                                                            .
                                    + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                  STRAIN
                           TIME = t - 6499.5635 Hours
                  where:
                           0.79385D+00
                  EØ
                                               T(1) =
T(2) =
                  E(1) -
                           0.54181D-01;
                                                        0.50000D-01
                           0.40374D-01;
                  E(2) •
                                                         0.50000D+00
                                               T(3) =
                           0.42858D-01;
                                                         0.50000D+01
                  E(3) =
                  E(4) =
E(5) =
                           0.35330D-01;
                                               T(4) =
                                                        0.50000D+02
                           0.649240-01;
                                               T(5) =
                                                         0.50000D+03
                  Average Error = 0.1077D-03
```

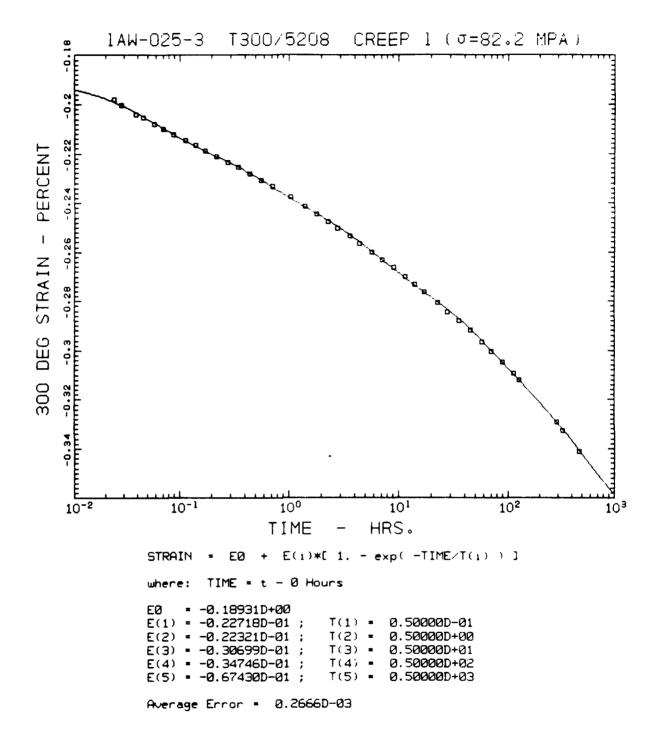


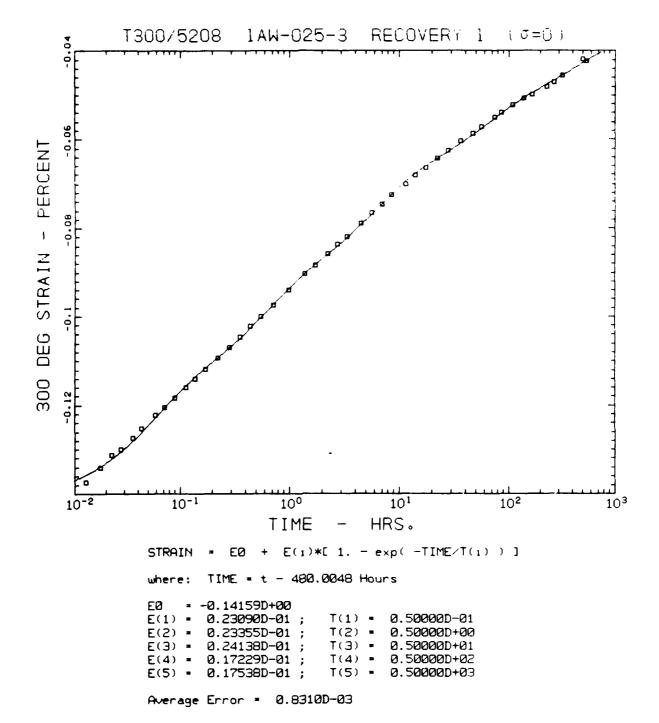










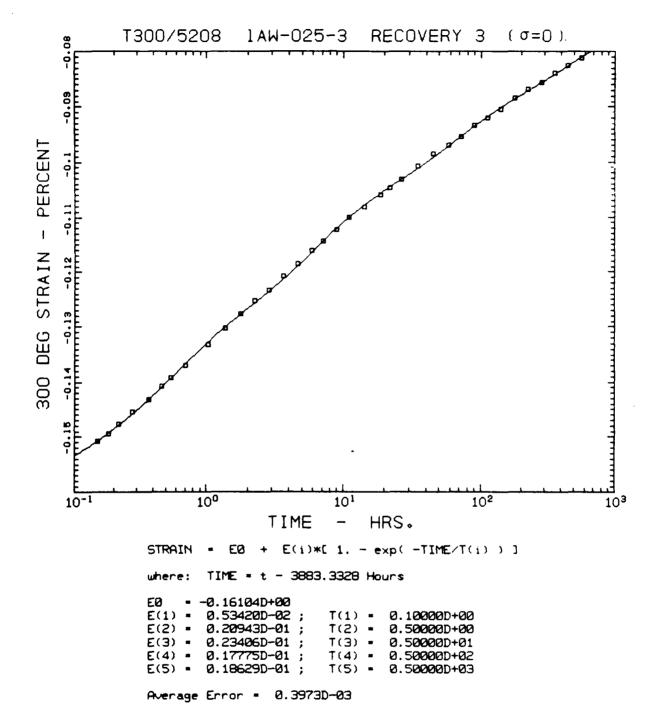


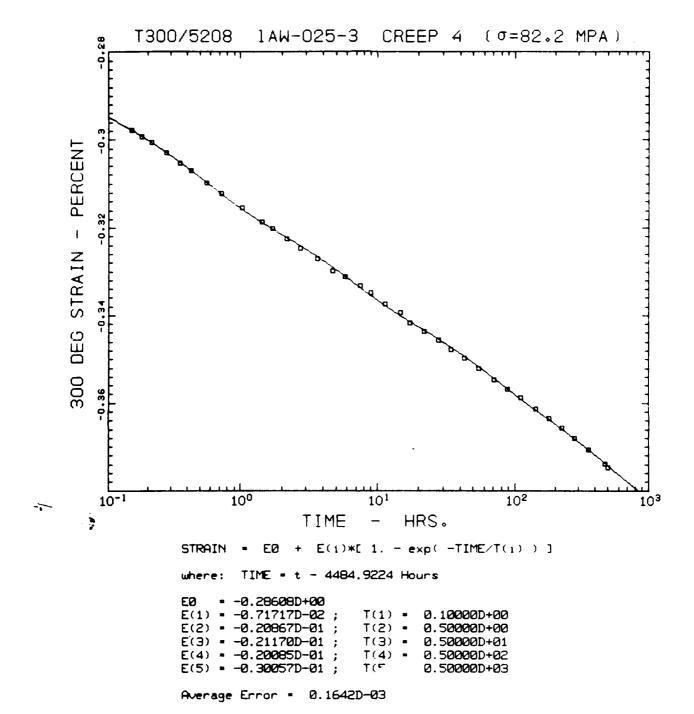
```
T300/5208
                         1AW-025-3
                                           CREEP 2 (J=82.2 MPA)
PERCENT
STRAIN
DEG
300
    10-2
                                  10°
                                                                10<sup>2</sup>
                                                                               10<sup>3</sup>
                  10^{-1}
                                                 101
                                TIME
                                              HRS.
               STRAIN
                              + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                       TIME * t ~ 1363.8534 Hours
               where:
               EØ
                    - -0.23246D+00
               E(1) = -0.27313D-01;
                                                 0.50000D-01
                                        T(1) =
               E(2) = -0.22863D-01;
                                        T(2) =
                                                 0.50000D+00
               E(3) = -0.23905D-01;
                                        T(3) =
                                                 0.50000D+01
               E(4) = -0.25079D-01;
                                        T(4) =
                                                 0.50000D+02
               E(5) = -0.42574D-01;
                                        T(5) =
                                                 0.50000D+03
               Average Error * 0.1808D-03
```

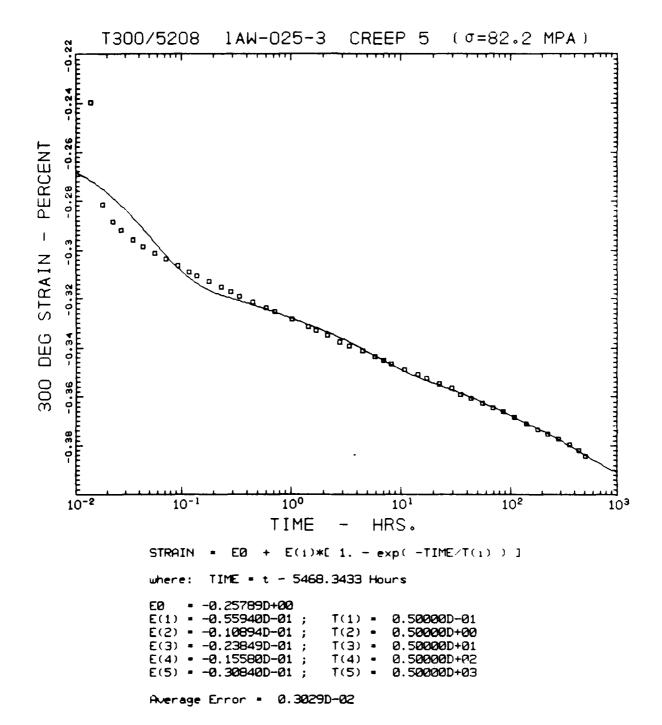
```
1AW-025-3
                                             RECOVERY 2 ( \sigma = 0 )
           T300/5208
PERCENT
STRAIN
300 DEG
    10-2
                  10-1
                                 10°
                                                10<sup>1</sup>
                                                               1∩2
                                                                             103
                               TIME
                                             HRS.
               STRAIN
                         E\emptyset + E(1)*[1, -exp(-TIME/T(1))]
                       TIME = t - 1844.3807 Hours
               where:
                    = -0.16066D+00
               E0
                      0.21889D-01;
               E(1) =
                                                0.50000D-01
                                       T(1) =
                       0.19059D-01;
                                       T(2) =
                                                0.50000D+00
               E(2) =
               E(3) =
                       0.22238D-01;
                                       T(3) =
                                                0.50000D+01
                       0.19807D-01;
                                        T(4) =
                                                0.50000D+02
               E(5) =
                       Ø.15673D-Ø1;
                                        T(5) =
                                                0.50000D+03
               Average Error = 0.6934D-03
```

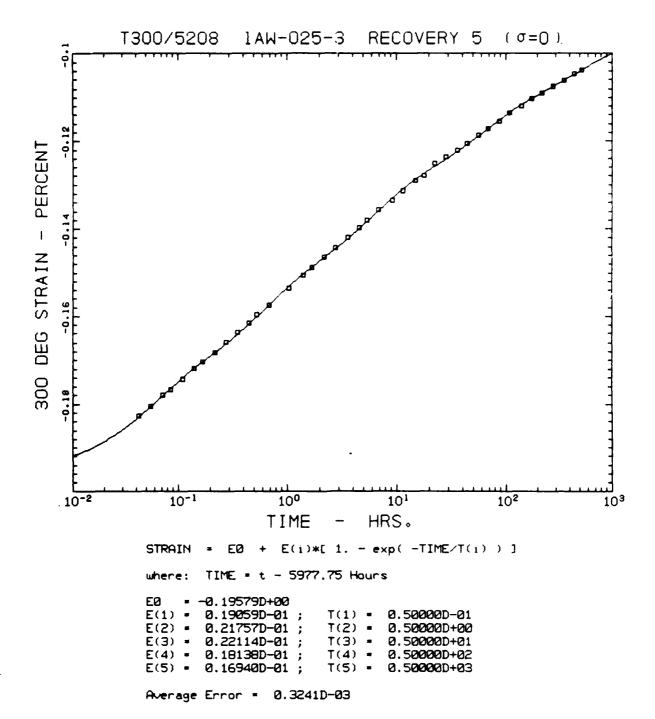
```
T300/5208 1AW-025-3 CREEP 3 (\sigma=82.2 MPA)
STRAIN
DEG
                                 10°
    10-2
                                               101
                                                              10<sup>2</sup>
                                                                             10<sup>3</sup>
                  10^{-1}
                                            HRS.
                               TIME
               STRAIN = E0 + E(i)*[ 1. - exp(-TIME/T(i)) ]
                       TIME = t - 3362.9292 Hours
                    - -0.25659D+00
               ΕØ
               E(1) = -0.18532D-01;
                                       T(1) =
                                               0.50000D-01
               E(2) = -0.19238D-01;
                                       T(2) =
                                               0.50000D+00
               E(3) = -0.22302D-01;
                                       T(3) =
                                               0.50000D+01
               E(4) - -0.23271D-01;
                                       T(4) =
                                               0.50000D+02
               E(5) = -0.39737D-01;
                                       T(5) =
                                               0.50000D+03
```

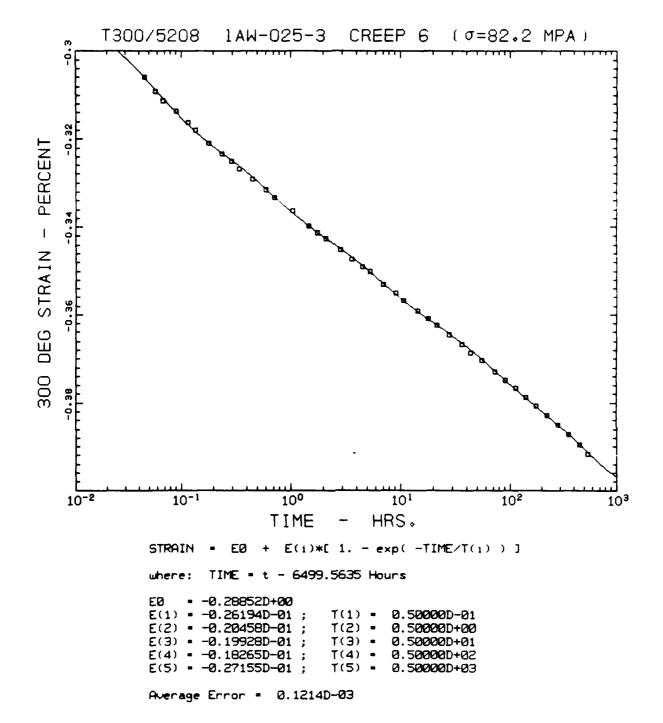
Average Error = 0.1460D-03

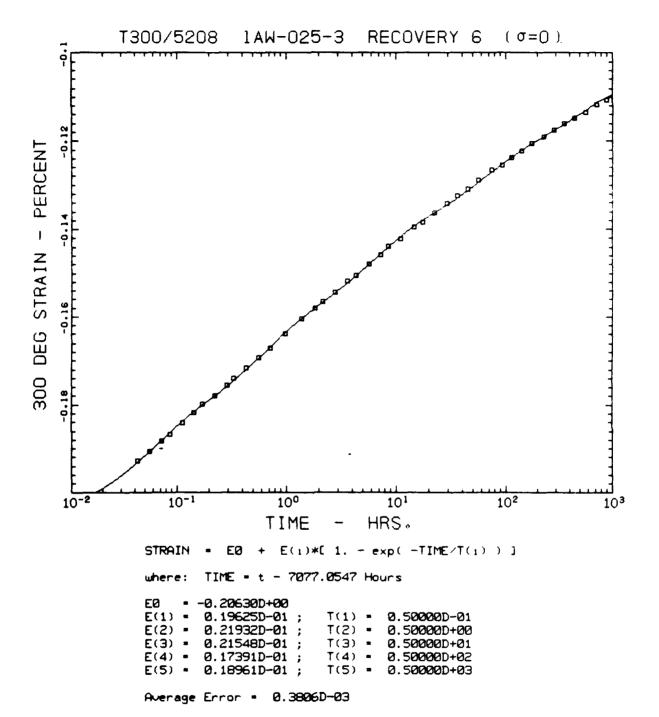


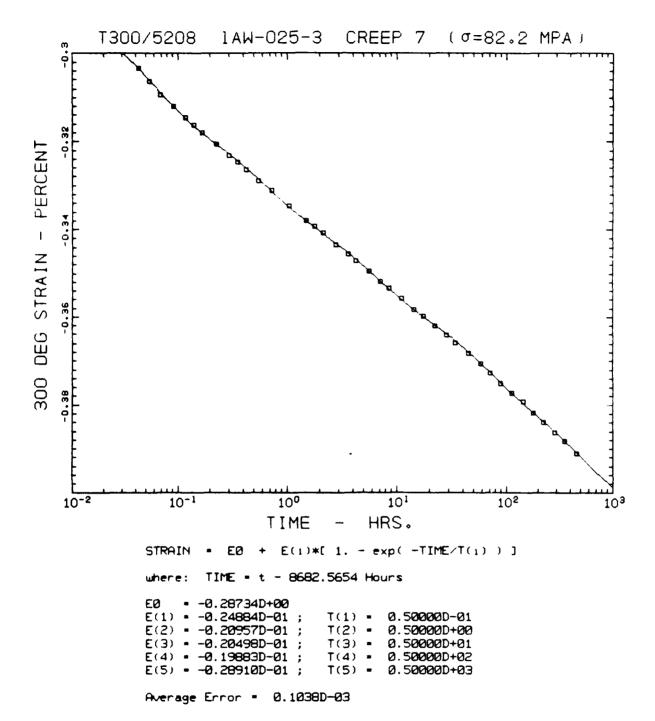


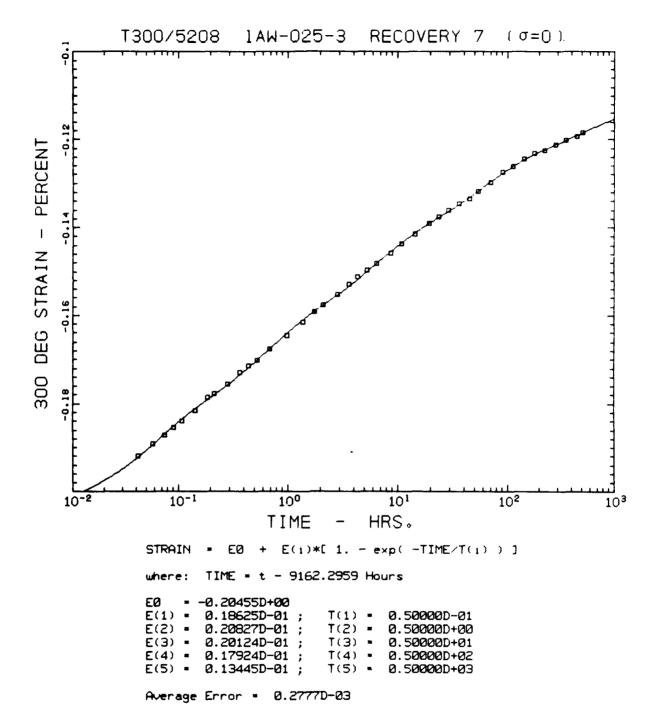








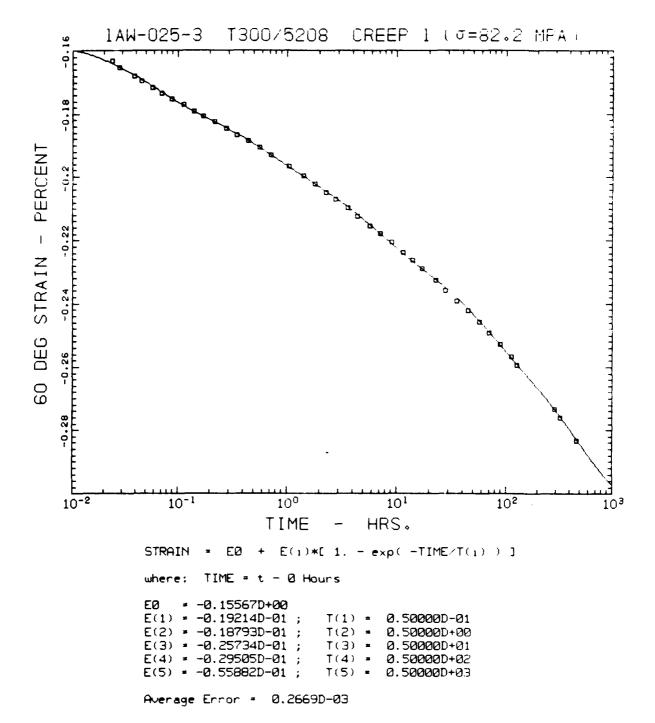


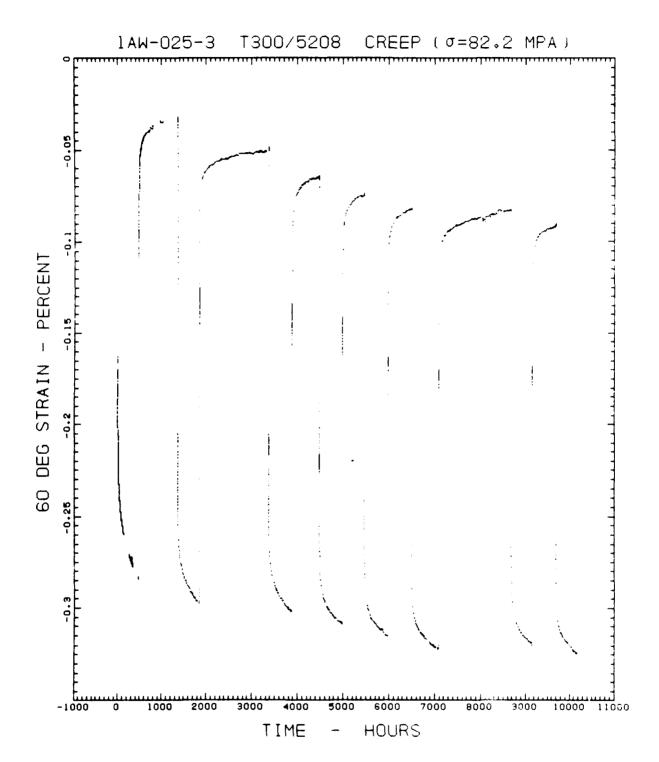


```
T300/5208
                                1AW-025-3 CREEP 8 (σ=82.2 MPA)
PERCENT
300 DEG STRAIN
                                                                                                   10<sup>3</sup>
     10-2
                       10-1
                                          10°
                                                             10<sup>1</sup>
                                                                                10<sup>2</sup>
                                                         HRS.
                                        TIME
                   STRAIN
                                 E\emptyset + E(i)*E1. - exp(-TIME/T(i))]
                             TIME = t - 9696.0508 Hours
                   E0 = -0.30720D+00
E(1) = -0.20416D-01;
E(2) = -0.19288D-01;
                                                             0.50000D-01
                                                   T(1) =
                                                             0.50000D+00
                                                   T(2) =
                   E(3) = -0.18673D-01;

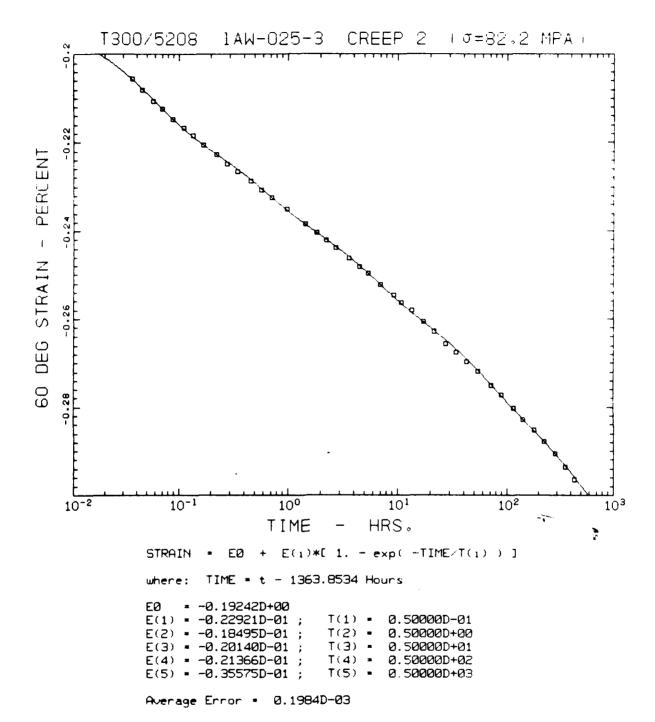
E(4) = -0.16622D-01;
                                                   T(3) =
                                                             0.50000D+01
                                                   T(4) =
T(5) =
                                                             0.50000D+02
                   E(5) = -0.24143D-01:
                                                             Ø.50000D+03
```

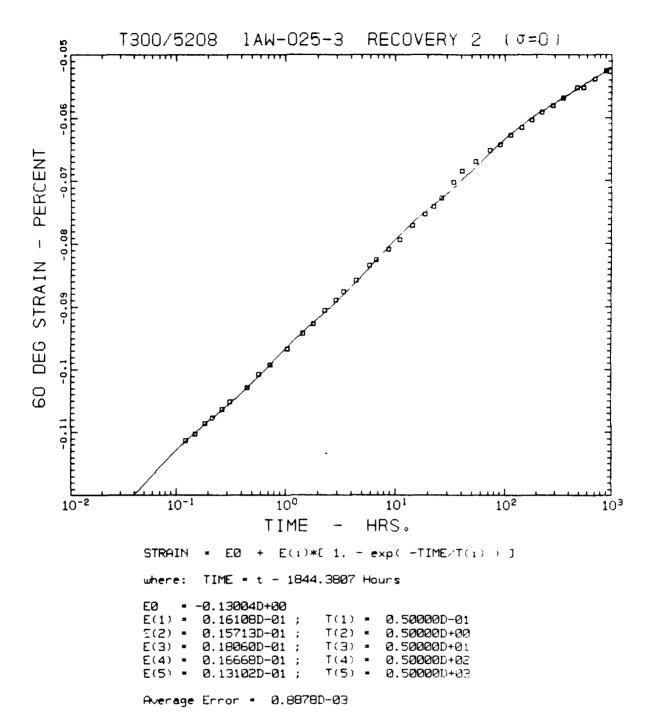
Average Error * 0.1358D-03

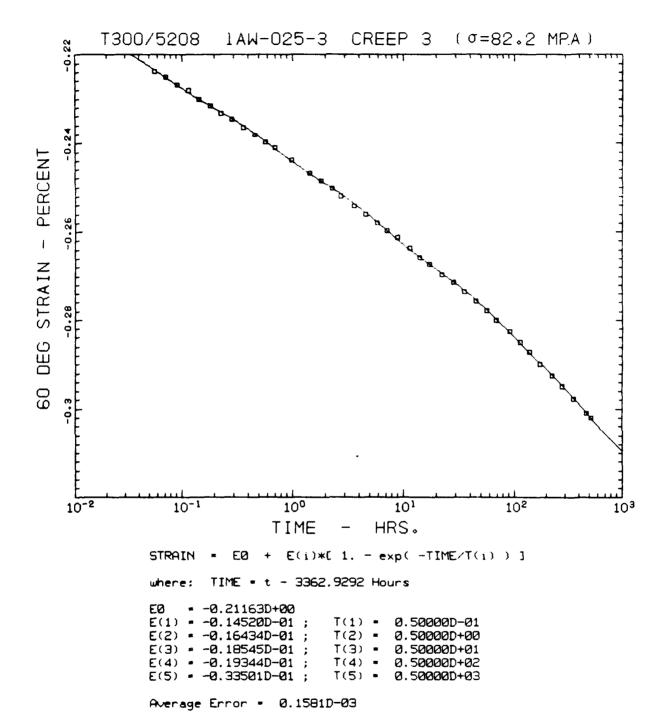


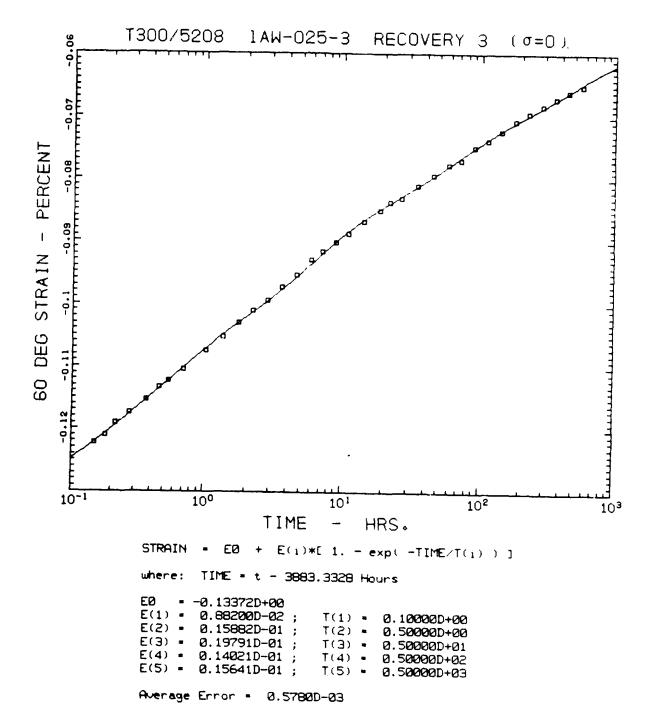


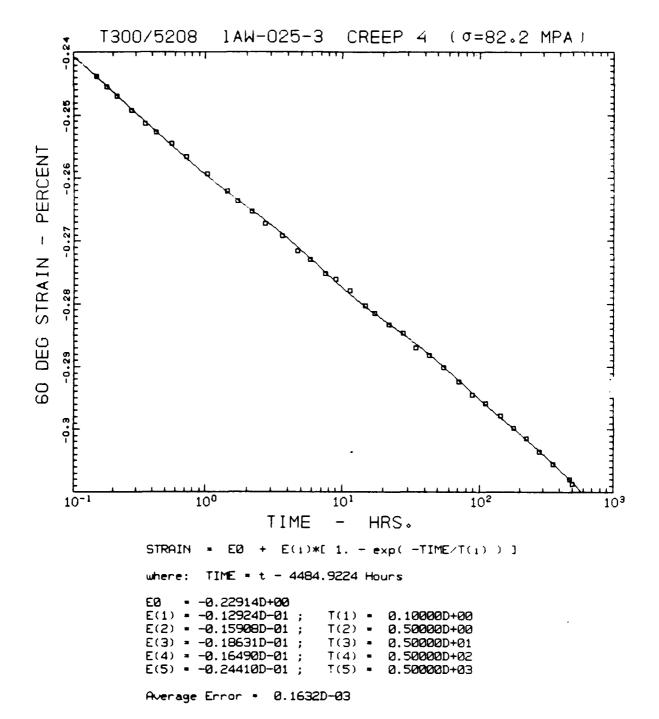
```
1AW-025-3
            T300/5208
                                              RECOVERY 1 (J=0)
- PERCENT
DEG STRAIN
9
                                                 101
                                                                 10^2
    10-2
                   10-1
                                  10<sup>0</sup>
                                                                                10^{3}
                                              HRS.
                                TIME
                              + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                        TIME = t - 480.0048 Hours
                     - -0.11657D+00
               EØ
                       0.18757D-01; 0.18953D-01;
                                                 0.50000D-01
               E(1) =
                                         T(1) =
                                         T(2) =
                                                 0.50000D+00
                                         T(3) =
                                                 0.50000D+01
                        0.20085D-01;
                        0.14226D-01;
                                         T(4) =
                                                 0.50000D+02
                       0.15044D-01;
                                         T(5) •
                                                 0.50000D+03
               Average Error * 0.9104D-03
```

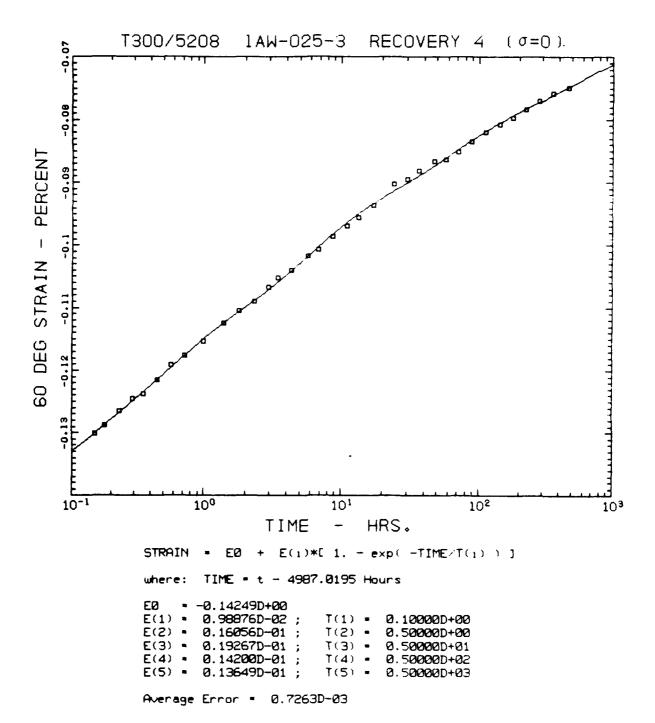


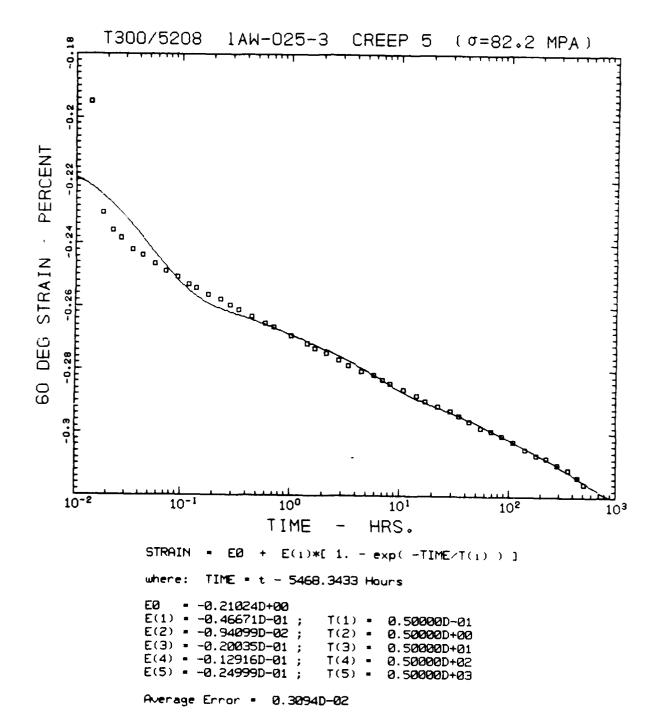


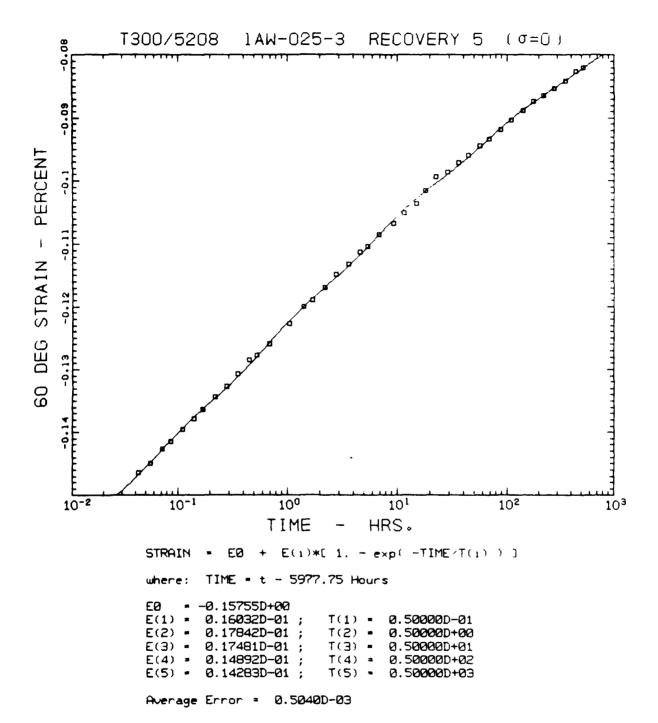












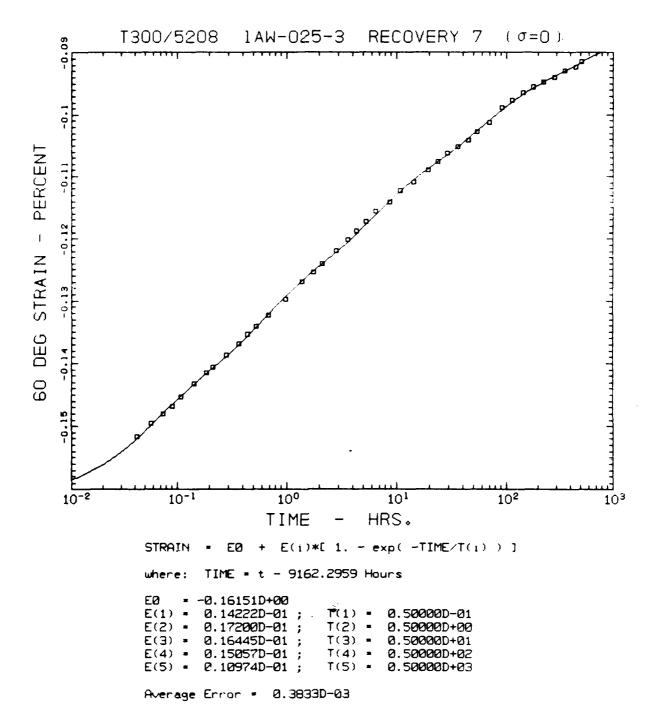
```
T300/5208
                             1AW-025-3 CREEP 6 (σ=82.2 MPA)
PERCENT
DEG STRAIN
90
                      10-1
                                       10°
     10-2
                                                         10<sup>1</sup>
                                                                          10<sup>2</sup>
                                                                                           10<sup>3</sup>
                                     TIME
                                                     HRS.
                             EØ + E(i)*[ 1. - exp(-TIME/T(1)) ]
                  STRAIN
                  where:
                           TIME = t - 6499.5635 Hours
                        - -0.23636D+00
                  EØ
                  E(1) = -0.20794D-01;
                                               T(1) =
                                                        0.50000D-01
                  E(2) = -0.17560D-01;
                                               T(2) =
                                                        0.50000D+00
                 E(3) = -0.16693D-01;
E(4) = -0.15013D-01;
E(5) = -0.22016D-01;
                                                        0.50000D+01
0.50000D+02
                                               T(3) •
                                               T(4) =
                                               T(5) =
                                                        0.50000D+03
```

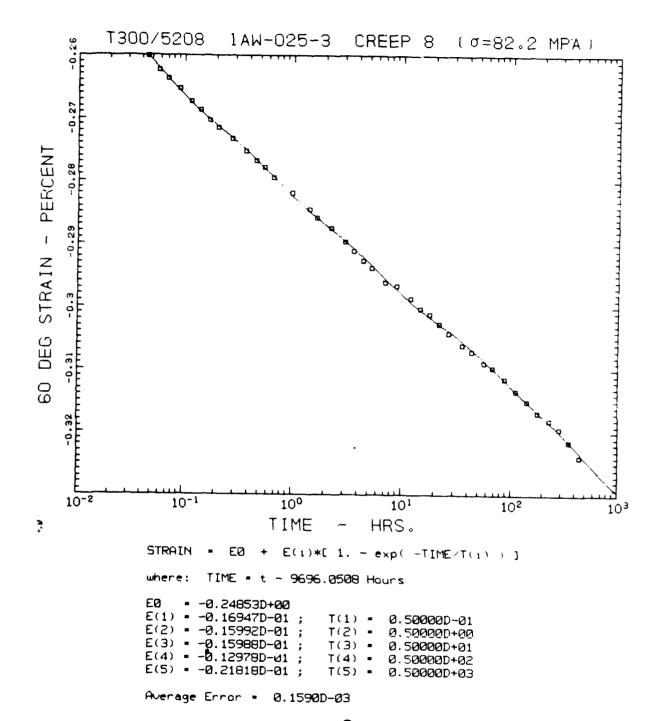
Average Error * 0.9692D-04

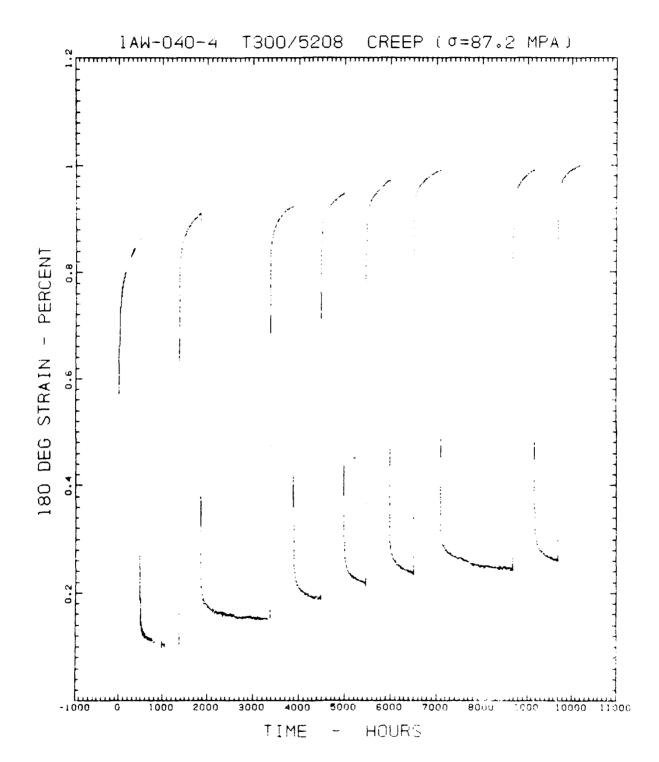
```
T300/5208
                                1AW-025-3
                                                     RECOVERY 6 (\sigma=0).
PERCENT
STRAIN
60 DEG
    10-2
                     10-1
                                       10°
                                                        101
                                                                         10<sup>2</sup>
                                                                                           10<sup>3</sup>
                                     TIME
                                                     HRS.
                              EØ + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                 STRAIN
                           TIME * t - 7077.0547 Hours
                        - -0.16439D+00
                           0.15669D-01;
                 E(1) =
                                              T(1) =
                                                        0.50000D-01
                           0.17600D-01;
                 E(2) •
                                              T(2) -
                                                        0.50000D+00
                          0.17966D-01;
0.13279D-01;
0.16298D-01;
                 E(3) =
                                              T(3) •
                                                        0.50000D+01
                 E(4) =
E(5) =
                                              T(4) =
T(5) =
                                                        0.50000D+02
0.50000D+03
                 Average Error = 0.7480D-03
```

```
T300/5208
                          1AW-025-3 CREEP 7 (σ=82.2 MPA)
PERCENT
60 DEG STRAIN
    10-2
                                                                                     103
                    10-1
                                     10°
                                                     101
                                                                     10<sup>2</sup>
                                   TIME
                                                  HRS.
                          = E\emptyset + E(1)*[1. - exp(-TIME/T(1))]
                 STRAIN
                          TIME = t - 8682.5654 Hours
                 where:
                     = -0.∠3346D+00
                 E(1) = -0.20404D-01;
                                            T(1) =
                                                     0.50000D-01
                 E(2) = -0.17231D-01;
                                            T(2) -
                                                     0.50000D+00
                E(3) = -0.17482D-01;
E(4) = -0.16115D-01;
E(5) = -0.23818D-01;
                                            T(3) =
                                                     0.50000D+01
                                            T(4) =
                                                     0.50000D+02
                                            T(5) -
                                                     0.50000D+03
```

Average Error = 0.1371D-03





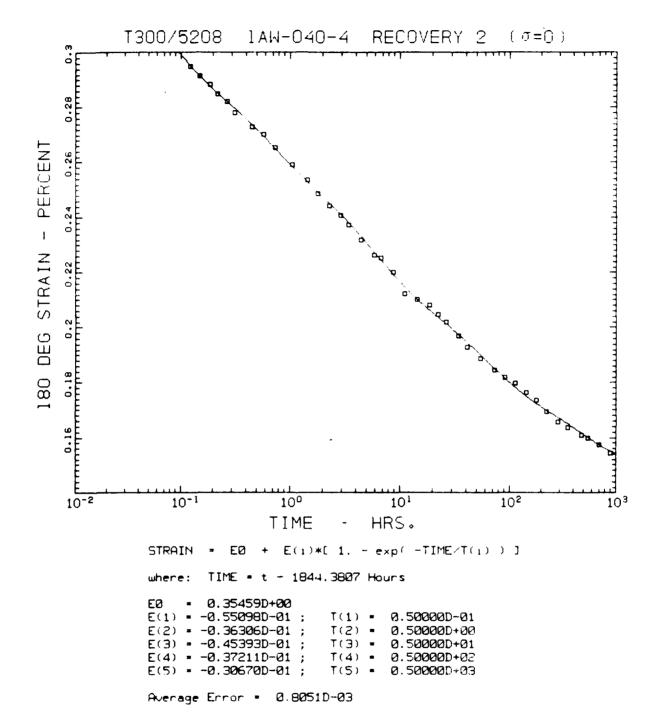


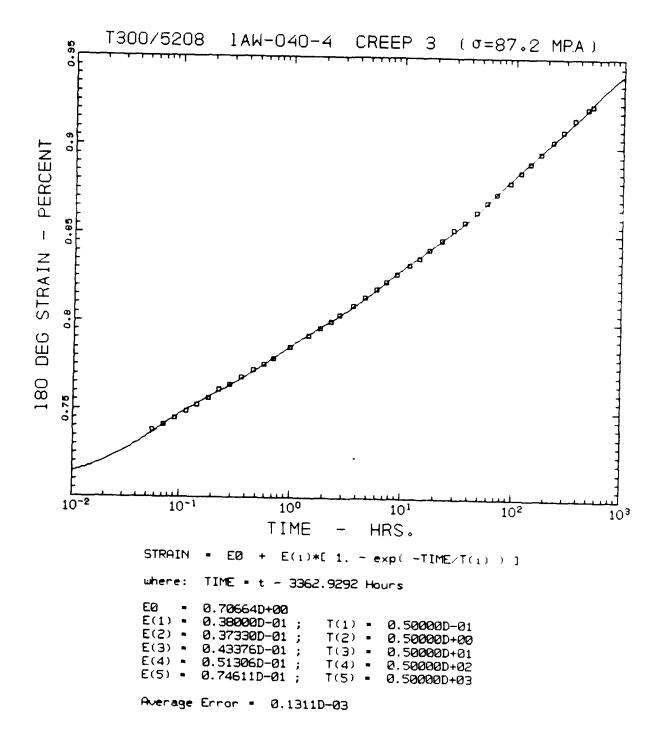
```
T300/5208
                                            CREEP 1 ( 0=87.2 MPA)
          1AW-040-4
PERCENT
STRAIN
180 DEG
                  10-1
    10-2
                                  10°
                                                 10<sup>1</sup>
                                                                10<sup>2</sup>
                                                                               10<sup>3</sup>
                                              HRS.
                                TIME
                          E0 + E(1)*[1. + exp(-TIME/T(1))]
                       TIME = t - 0 Hours
               where:
               EØ
                       0.55564D+00
                       0.41712D-01 ;
                                        T(1) = 0.50000D-01
                       0.45130D-01;
                                        T(2) = 0.50000D+00
                       0.60615D-01;
                                        T(3) = 0.50000D+01
               E(4) =
                       0.68532D-01;
                                        T(4) = 0.50000D+02
                       0.14737D+00;
                                         T(5) = 0.50000D+03
               Average Error = 0.1490D-03
```

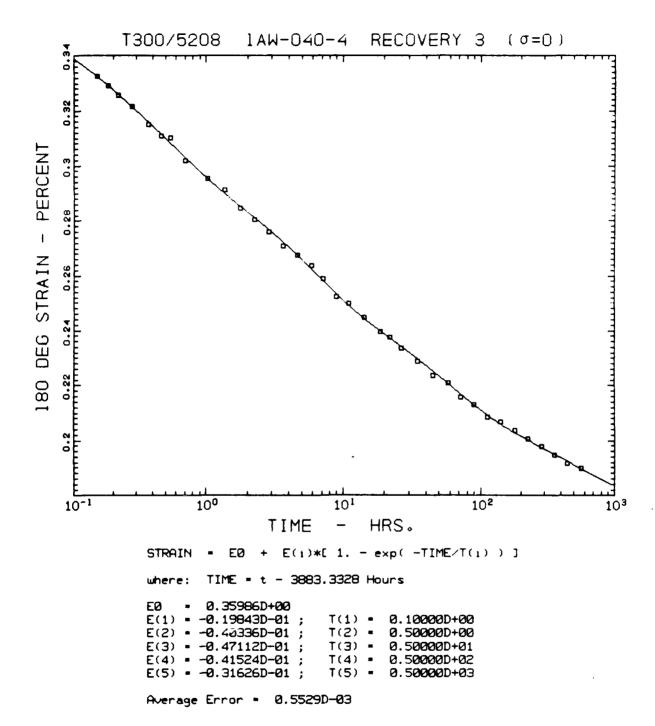
```
T300/5208 1AW-040-4
                                                   RECOVERY 1 (\sigma=0)
PERCENT
STRAIN
DEG
180
                    10-1
    10-2
                                    100
                                                     10<sup>1</sup>
                                                                     10<sup>2</sup>
                                                                                      10^{3}
                                  TIME
                                                  HRS.
                            EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                         TIME = t - 480.0048 Hours
                ΕØ
                    = 0.29219D+00
                E(1) = -0.45027D-01;
                                           T(1) = 0.50000D-01
                E(2) = -0.44658D - 01;
                                           T(2) =
                                                    0.50000D+00
               E(3) = -0.46717D-01;
E(4) = -0.35343D-01;
E(5) = -0.25117D-01;
                                           T(3) =
                                                    0.50000D+01
                                           T(4) =
                                                    0.50000D+02
                                           T(5) =
                                                    0.50000D+03
                Average Error * 0.1115D-02
```

```
CREEP 2 (\sigma=87.2 MPA)
         T300/5208
                           1AW-040-4
STRAIN
DEG
180
    10-2
                    10^{-1}
                                    10°
                                                    10¹
                                                                     10<sup>2</sup>
                                                                                    10<sup>3</sup>
                                                 HRS.
                                  TIME
                STRAIN
                            EØ + E(i)*[ 1.
                                                exp( -TIME/T(1) ) ]
                         TIME = t - 1363.8534 Hours
                where:
                         0.67502D+00
                ΕØ
                                           T(1) =
T(2) =
                                                    0.50000D-01
                E(1) =
                         0.39368D-01;
                         0.44001D-01 ;
                                                    0.50000D+00
                         0.46266D-01;
                                           T(3) =
                                                    0.50000D+01
                E(4) = 0.50043D-01;

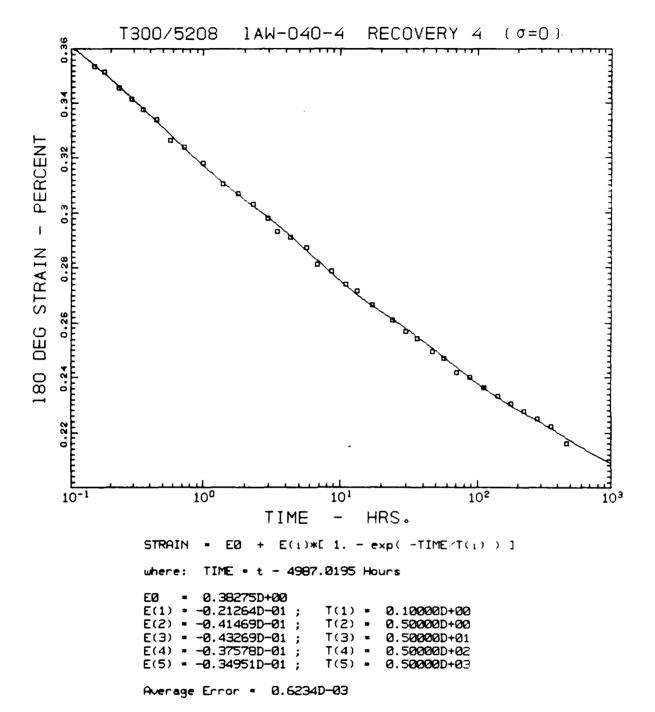
E(5) = 0.90054D-01;
                                           T(4) =
T(5) =
                                                    0.50000D+02
                                                    0.50000D+03
                Average Error = 0.1502D-03
```

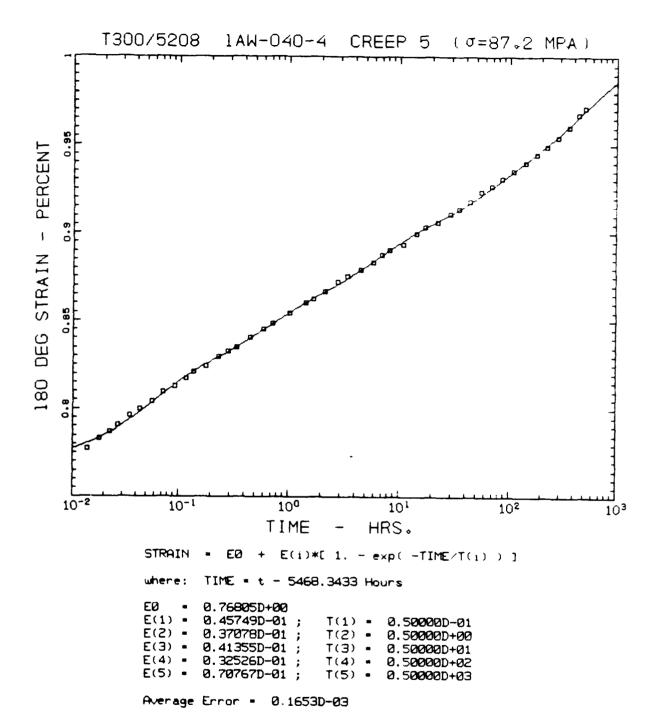


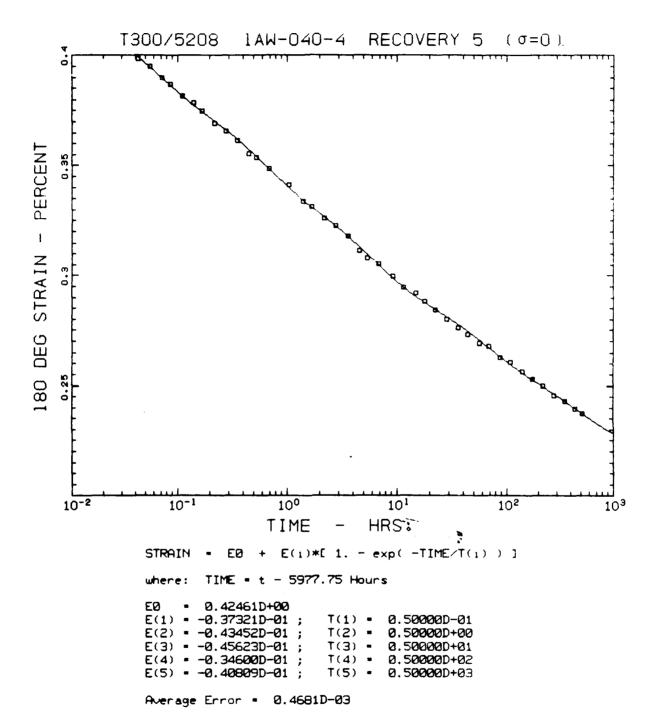




```
T300/5208
                                              CREEP 4 ( \sigma = 87.2 MPA )
                            1AW-040-4
PERCENT
STRAIN
DEG
180
    0.82
    9:0
                       10°
                                                                 10<sup>2</sup>
                                            10<sup>1</sup>
    10-1
                                                                                     10<sup>3</sup>
                                  TIME
                                                 HRS.
                STRAIN
                                   E(i)*[1. - exp(-TIME/T(i))]
                         TIME = t - 4484.9224 Hours
                where:
                EØ
                         0.76278D+00
                         0.22909D-01;
0.36797D-01;
                E(1) =
                                                    0.10000D+00
                                           T(1) =
                E(2) •
                                           T(2) -
                                                    0.50000D+00
                E(3) =
                         0.42043D-01;
                                           T(3) •
                                                    0.50000D+01
                E(4) =
                         0.39313D-01;
                                           T(4) •
                                                    0.50000D+02
                E(5) .
                         0.67708D-01;
                                           T(5) =
                                                    0.50000D+03
                Average Error - 0.1218D-03
```

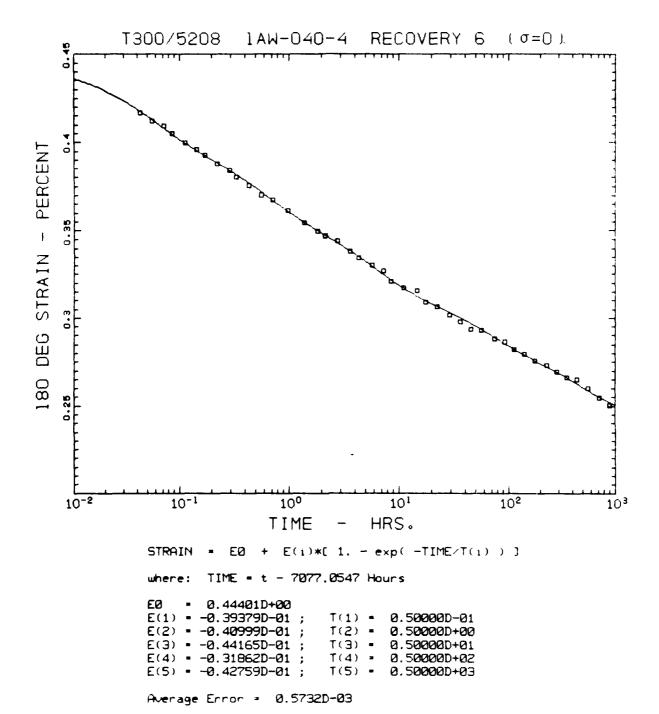


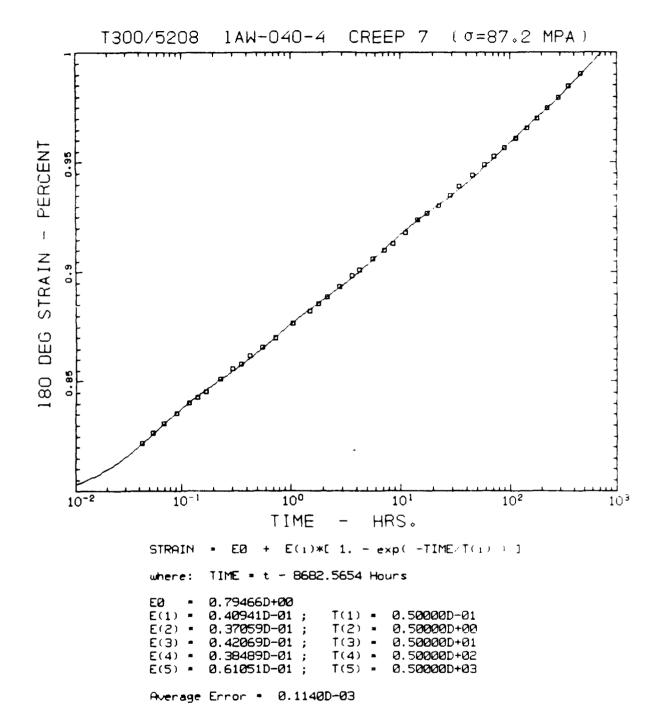


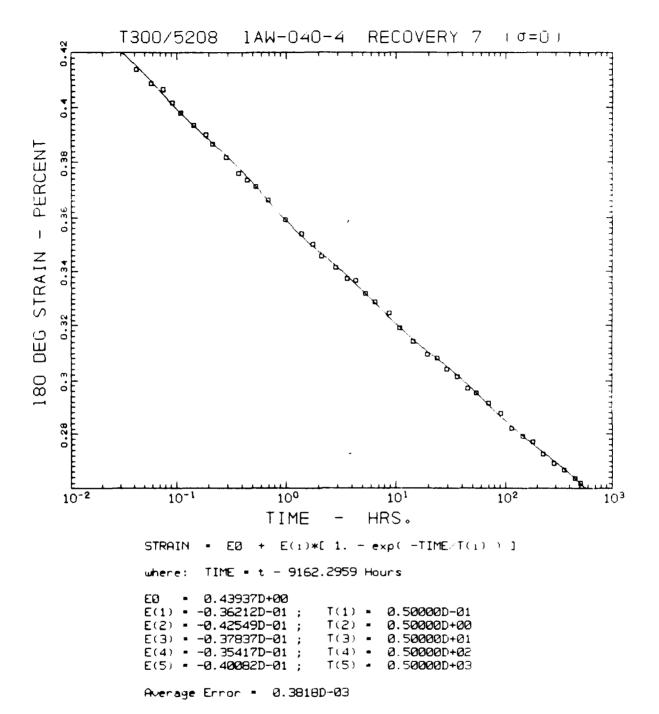


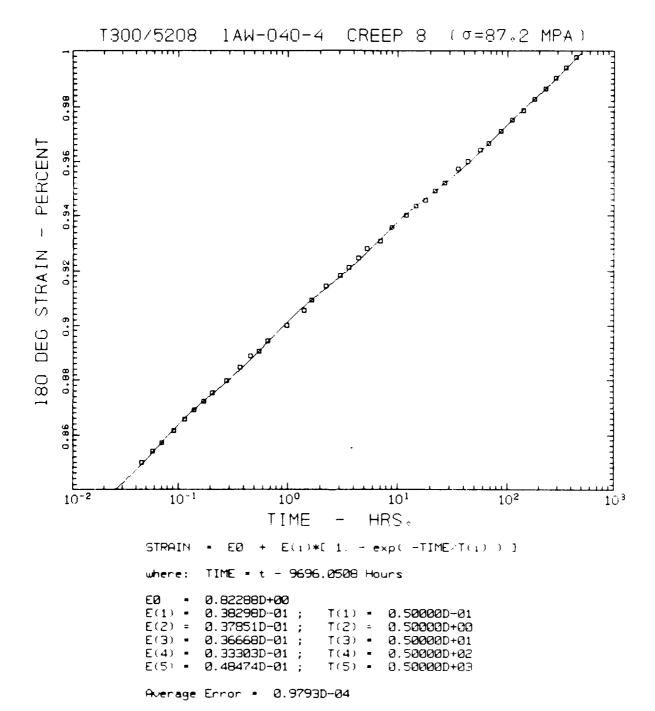
```
T300/5208
                            1AW-040-4 CREEP 6
                                                             (σ=87.2 MPA)
PERCENT
STRAIN
180 DEG
                                     10°
    10<sup>-2</sup>
                    10^{-1}
                                                      10<sup>1</sup>
                                                                       10<sup>2</sup>
                                                                                       10<sup>3</sup>
                                                HRS.
                                   TIME
                                  + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                          TIME = t - 6499.5635 Hours
                 EØ
                          0.79462D+00
                          0.41047D-01;
                                            T(1) =
                 E(1) =
                                                      0.50000D-01
                          0.37818D-01;
0.39787D-01;
                                             T(2) =
                                                      0.50000D+00
                                             T(3) -
                                                      0.50000D+01
                          0.36324D-01;
                 E(4) =
                                             T(4) -
                                                      0.50000D+02
                 E(5) =
                          Ø.58868D-Ø1;
                                             T(5) •
                                                      0.50000D+03
```

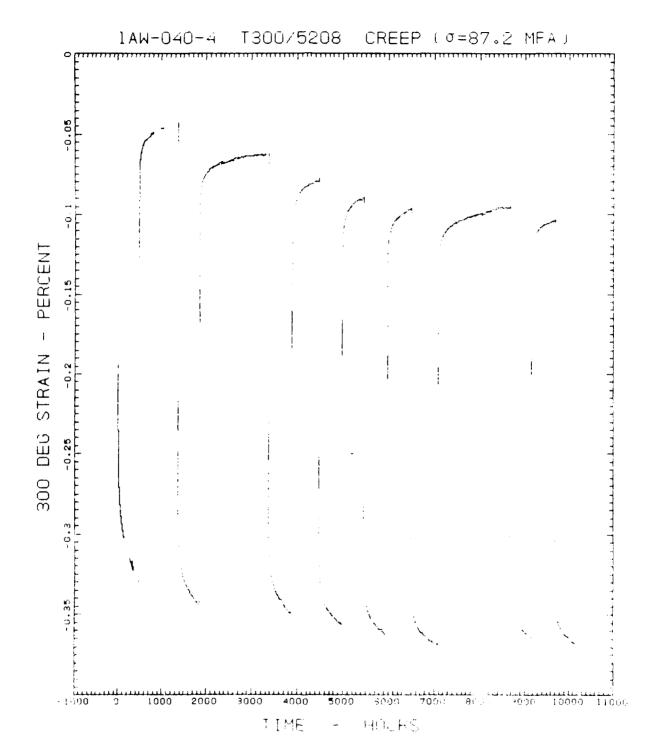
Average Error * 0.1113D-03











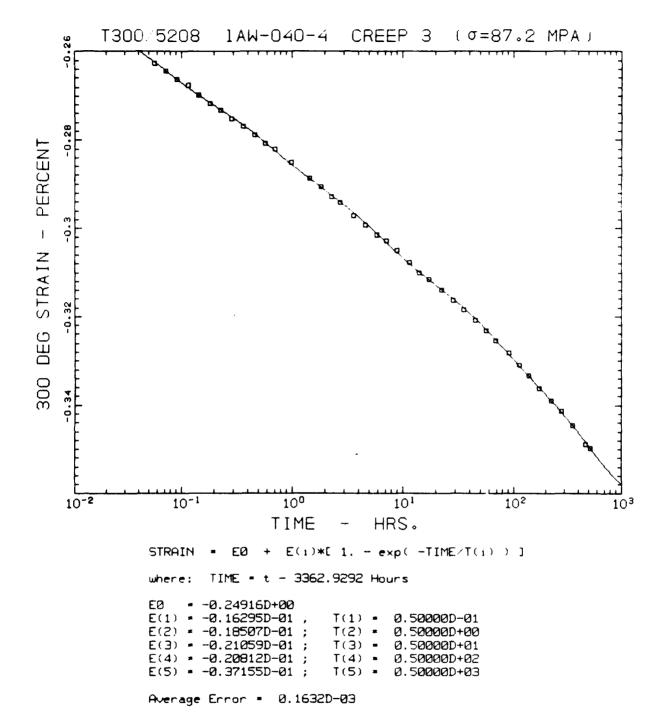
```
T300/5208
                                              CREEP 1 (\sigma=87.2 MPA)
          1AW-040-4
PERCENT
DEG STRAIN
300
                                   10<sup>0</sup>
                                                                   10<sup>2</sup>
                                                   10<sup>1</sup>
                                                                                   10<sup>3</sup>
    10-2
                   10-1
                                                HRS.
                                  TIME
                                + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                        TIME * t + 0 Hours
                where:
                EØ
                     = -0.18596D+00
                E(1) = -0.19364D-01;
                                                   0.50000D-01
                                           T(1) =
                E(2) = -0.20809D-01;
                                           T(2) =
                                                   0.50000D+00
                E(3) = -0.29633D-01;
                                           T(3) =
                                                   0.50000D+01
                E(4) = -0.34947D-01;
                                                   0.50000D+02
                                           T(4) =
                                          T(5) =
                E(5) = -0.61945D-01;
                                                   0.50000D+03
                Average Ernor = 0.2317D-03
```

```
RECOVERY 1 ( \sigma = D )
             T300/5208
                                1AW-040-4
- PERCENT
DEG STRAIN
300
                                      10<sup>0</sup>
     10-2
                     10-1
                                                       10<sup>1</sup>
                                                                         10<sup>2</sup>
                                                                                         10<sup>3</sup>
                                                    HRS.
                                    TIME
                              E\emptyset + E(i)*[1. - exp(-TIME(f(i))]
                           TIME = t - 480.0048 Hours
                  where:
                       - -0.13889D+00
                 E(1) = 0.21259D-01;
                                                       0.50000D-01
                                              T(1) =
                                              T(2) =
                 E(2) =
                          0.21668D-01;
                                                       0.50000D+00
                                                       0.50000D+01
0.50000D+02
0.50000D+03
                          0.23309D-01;
                                              T(3) =
                                              T(4) =
                 E(4) =
                          0.15914D-01 ;
                                              f(5) •
                 E(5) = 0.15738D-01;
                 Average Error = 0.7977D-03
```

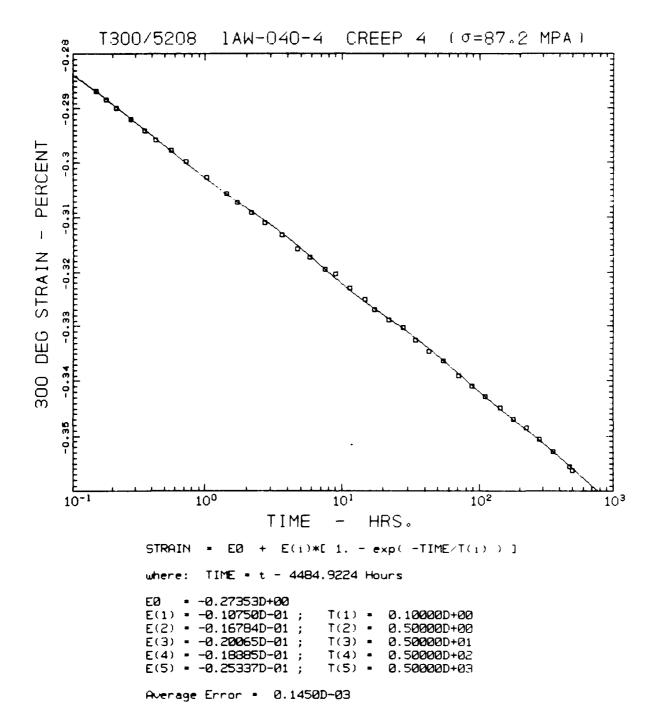
```
CREEP 2
                                                       (σ=87.2 MPA)
        T300/5208
                         1AW-040-4
STRAIN
DEG
300
                                 10<sup>0</sup>
                                                                              10<sup>3</sup>
                                                 101
                                                                10<sup>2</sup>
    10^{-2}
                  10^{-1}
                                              HRS.
                                TIME
                       * EØ + E(1)*[ 1. - exp(-TIME/T(1)) ]
                      TIME = t - 1363.8534 Hours
                   = -0.23499D+00
               EØ
               E(1) = -0.19752D-01;
                                        T(1) =
                                                0.50000D-01
               E(2) = -0.20628D-01;
                                        T(2) =
                                                0.50000D+00
               E(3) = -0.22367D-01;
                                                0.50000D+01
                                        T(3) =
               E(4) = -0.23114D-01;
                                        T(4) =
                                                0.50000D+02
               E(5) = -0.37325D-01;
                                        T(5) -
                                                0.50000D+03
```

Average Error = 0.1532D-03

```
T300/5208
                              1AW-040-4
                                                RECOVERY 2 10=01
PERCENT
300 DEG STRAIN
                                   10°
                                                                                  103
    10-2
                   10^{-1}
                                                   10<sup>1</sup>
                                                                   10<sup>2</sup>
                                                HRS.
                                 TIME
                                  E(i)*[1. - exp(-TIME(T(i)))]
                STRAIN
                         TIME = t - 1844.3807 Hours
                EØ
                     - -0.14928D+00
                        0.14311D-01 ;
                E(1) =
                                          T(1) =
                                                   0.50000D-01
                        0.18036D-01;
0.21389D-01;
                E(2) =
                                          T(2) =
                                                   0.500000+00
                                                   0.50000D+01
                E(3) =
                                          T(3) *
                E(4) =
                        0.17735D-01;
                                          T(4) -
                                                   0.50000D+02
                                          T(5) =
                E(5) *
                        0.15564D-01;
                                                   0.50000D+03
                Average Error * 0.6341D-03
```



```
T300/5208
                                                        RECOVERY 3
                                   1AW-040-4
                                                                                (\sigma=0).
PERCENT
STRAIN
300 DEG
                           10°
                                                  10<sup>1</sup>
                                                                          10<sup>2</sup>
     10^{-1}
                                                                                                 10<sup>3</sup>
                                       TIME
                                                        HRS.
                                     + E(i)*[ 1. - exp( -TIME/T(1) ) ]
                             TIME = t - 3883.3328 Hours
                         = -0.15784D+00
= 0.79561D-02;
= 0.19093D-01;
                                                 T(1) =
T(2) =
                                                            0.10000D+00
                   E(1) =
                                                            0.50000D+00
                             0.22890D-01;
                   E(3) =
                                                 T(3) =
                                                            0.50000D+01
                  E(4) =
E(5) =
                             0.16625D-01;
0.17764D-01;
                                                 T(4) =
                                                            0.50000D+02
                                                            0.50000D+03
                                                  T(5) =
                   Average Error = 0.4092D-03
```

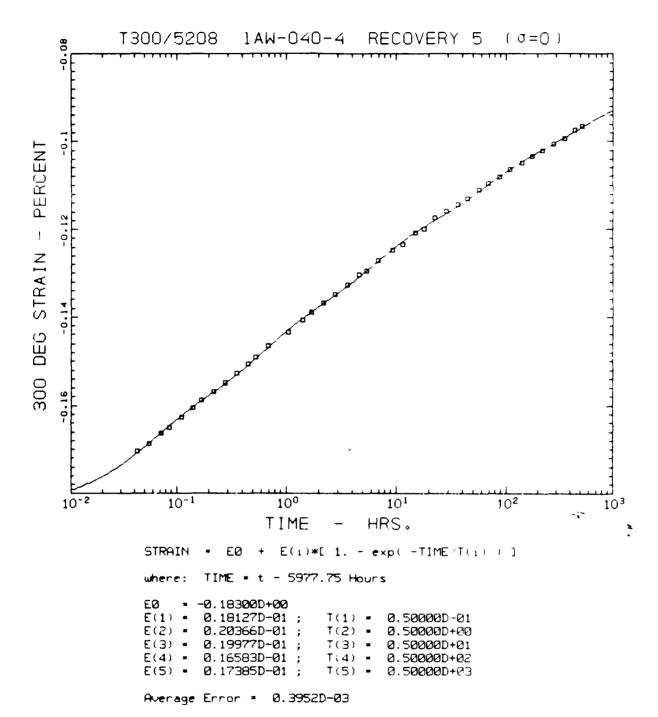


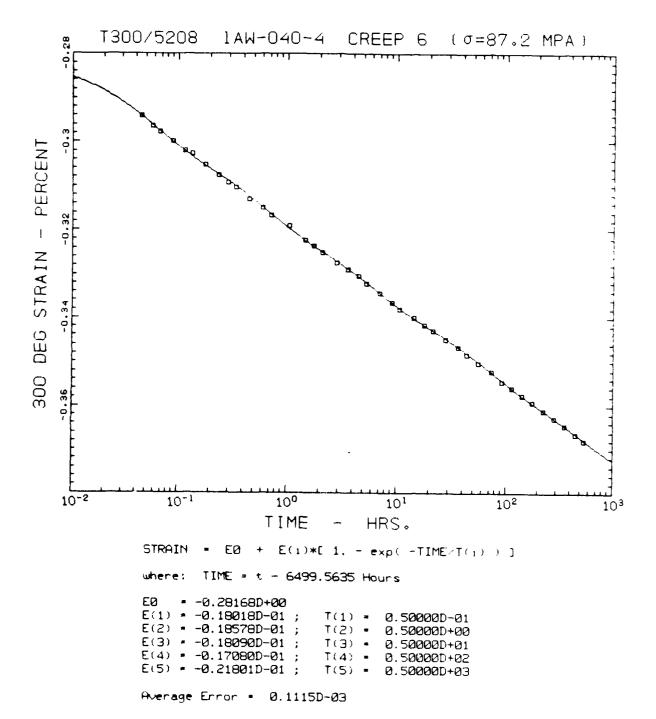
```
RECOVERY 4 (\sigma=0)
             T300/5208
                                1AW-040-4
PERCENT
STRAIN
DEG
300
                         10°
                                                                   10<sup>2</sup>
                                              10<sup>1</sup>
    10^{-1}
                                                                                        10<sup>3</sup>
                                            - HRS.
                                   TIME
                 STRAIN = EØ + E(1)*[ 1. - exp(-TIME/T(1) + ]
                 where: TIME * t - 4987.0195 Hours
                      - -0.16730D+00
- 0.11636D-01;
- 0.18010D-01;
                 EØ
                 E(1) =
                                             T(1) -
                                                      0.10000D+00
                                             T(2) •
                                                      0.50000D+00
                 E(2) *
                          0.22188D-01;
0.16159D-01;
                 E(3) =
                                             T(3) =
                                                      0.50000D+01
                 E(4) =
                                             T(4) =
                                                     0.50000D+02
                 E(5) = 0.15842D-01;
                                             T(5) = 0.50000D+03
```

Average Error • 0.5913D-03

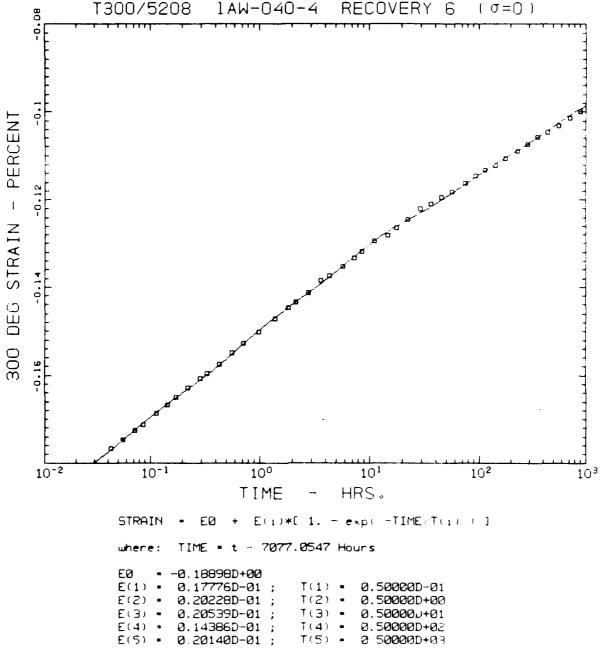
```
CREEP 5
                                                              (\sigma = 87.2 \text{ MPA})
         T300/5208
                            1AW-040-4
PERCENT
STRAIN
DEG
300
                                                                     10<sup>2</sup>
                                     10°
                                                     101
                    10-1
                                                                                     10<sup>3</sup>
    10-2
                                   TIME
                                                  HRS.
                                 + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                          TIME = t - 5468.3433 Hours
                 where:
                E0 = -0.27253D+00
E(1) = -0.21566D-01;
                                            T(1) =
                                                     0.50000D-01
                                            1(5) =
                 E(2) = -0.17925D-01;
                                                     0.50000D+00
                 E(3) = -0.18868D-01;
                                            T(3) =
                                                     0.50000D+01
                 E(4) = -0.15805D-01;
                                            T(4) .
                                                     0.50000D+02
                 E(5) = -0.25684D-01;
                                            T(5) -
                                                     0.50000D+03
```

Average Error = 0.2227D-03

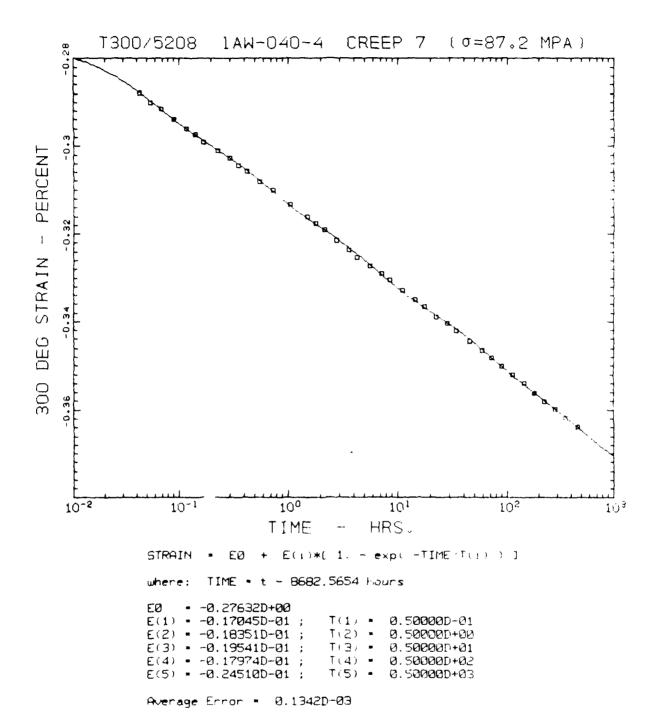


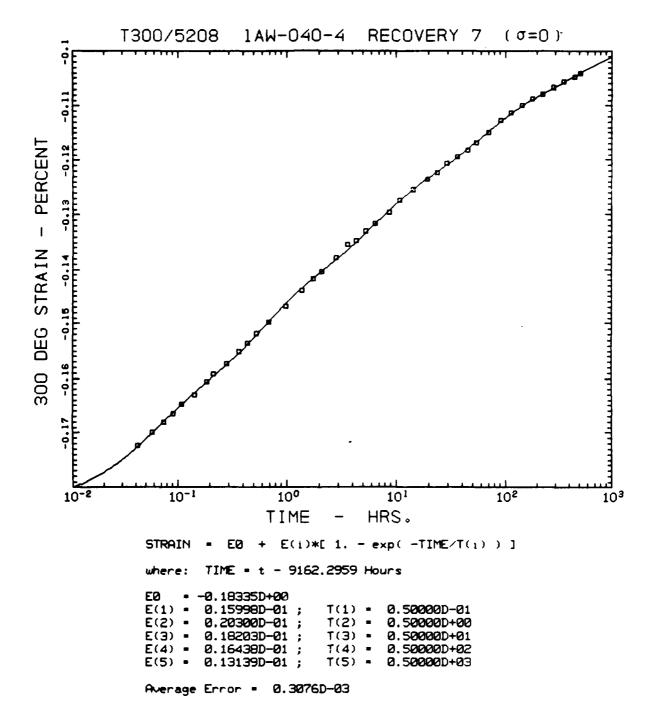


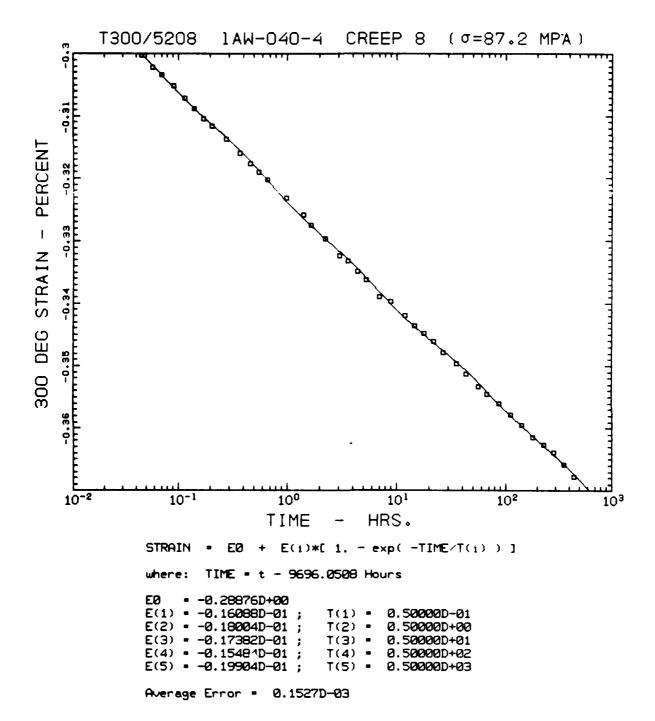
A Maria Colored Maria Colored Colored Maria Colored Maria Colored Colo



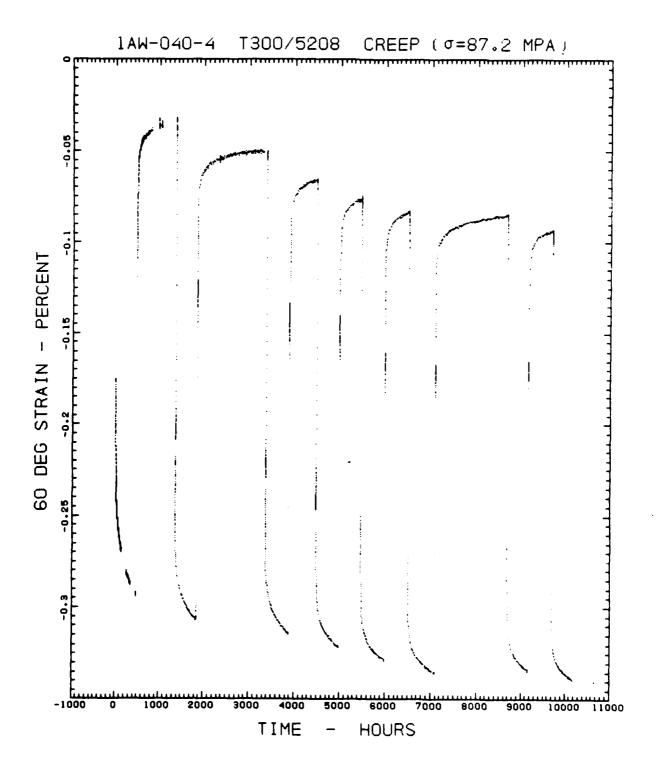
Average Error = 0.5985D-03

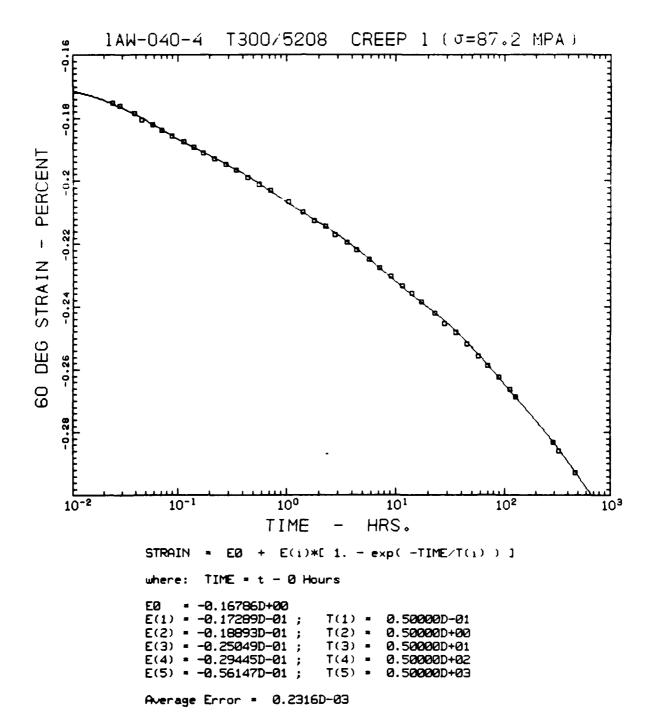






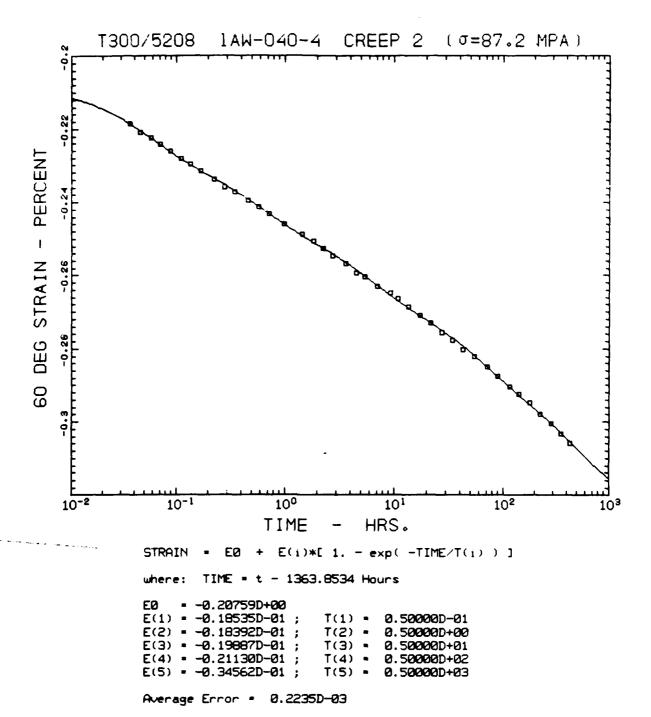
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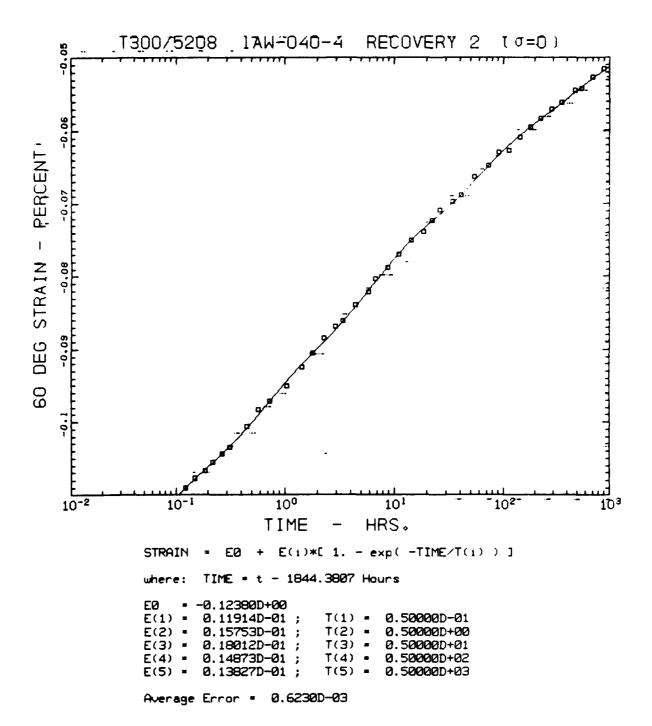


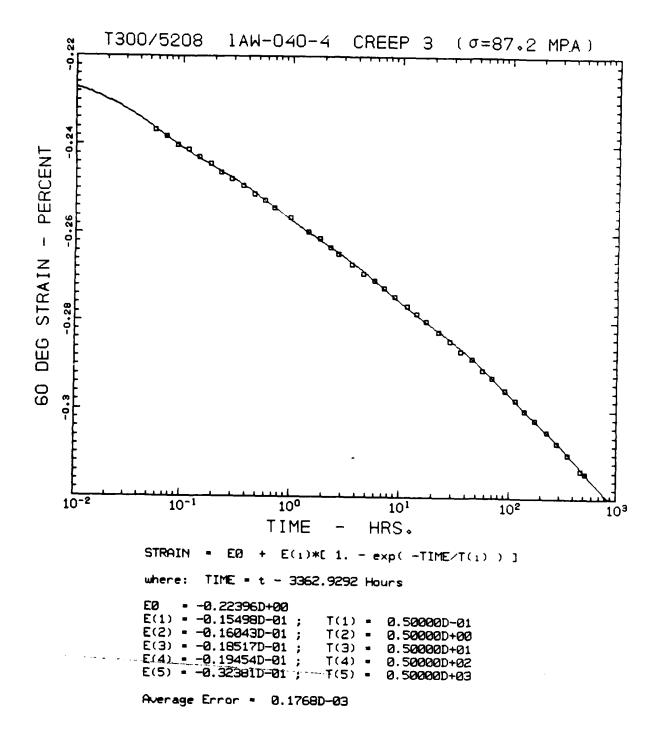


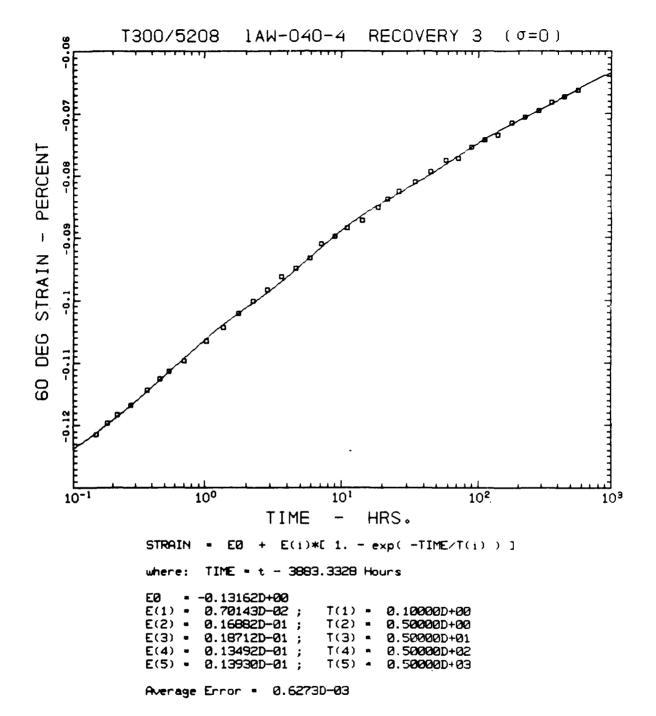
```
T300/5208
                                 1AW-040-4 RECOVERY 1 (\sigma=0)
PERCENT
DEG STRAIN
9
     10-2
                      10-1
                                        10°
                                                         10<sup>1</sup>
                                     TIME
                                                      HRS.
                  STRAIN
                                      E(i)*[1. - exp(-TIME/T(i))]
                           TIME = t - 480.0048 Hours
                        = -0.11449D+00
                  Ε0
                  E(1) =
                           0.17071D-01;
                                               T(1) =
                                                         0.50000D-01
                  E(2) =
                           0.18740D-01;
                                               T(2) =
                                                         0.50000D+00
                           0.19175D-01;
0.13755D-01;
0.15638D-01;
                                                         0.50000D+01
0.50000D+02
0.50000D+03
                                               T(3) •
                  E(4) =
E(5) =
                                               T(4) = T(5) =
```

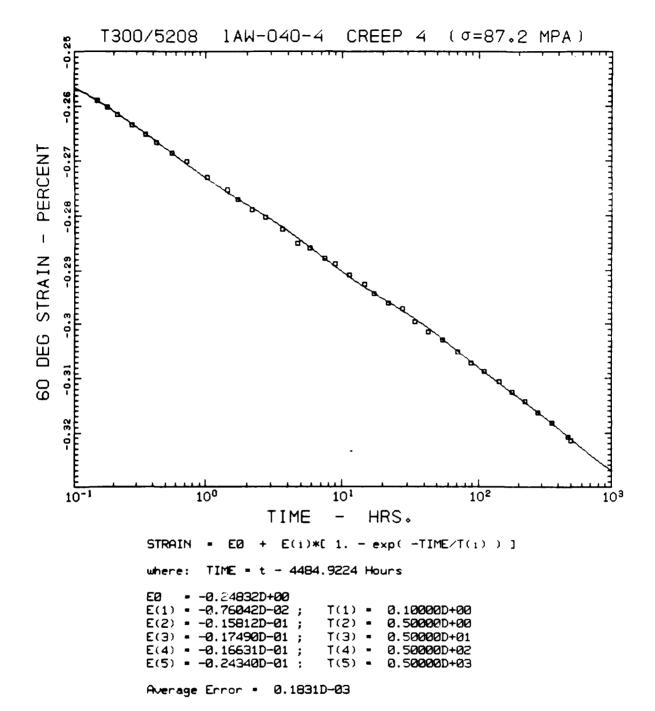
Average Error * 0.9062D-03

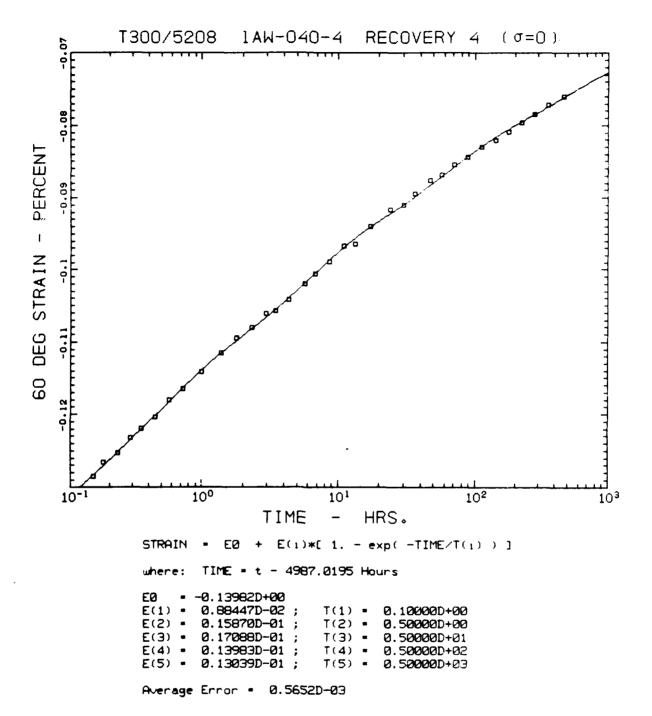




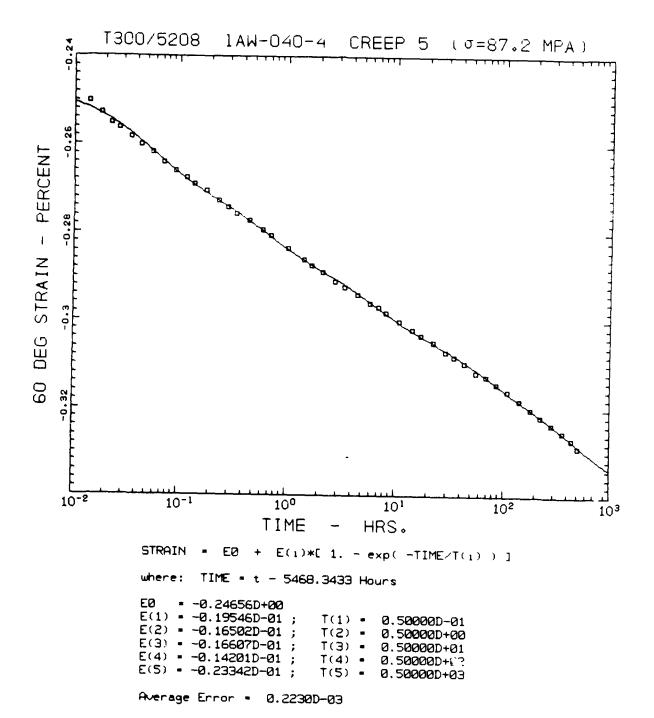


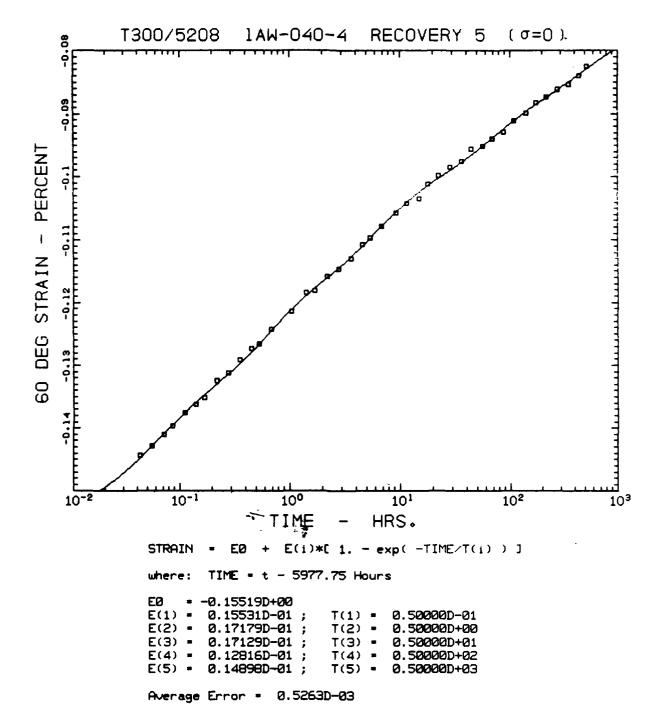


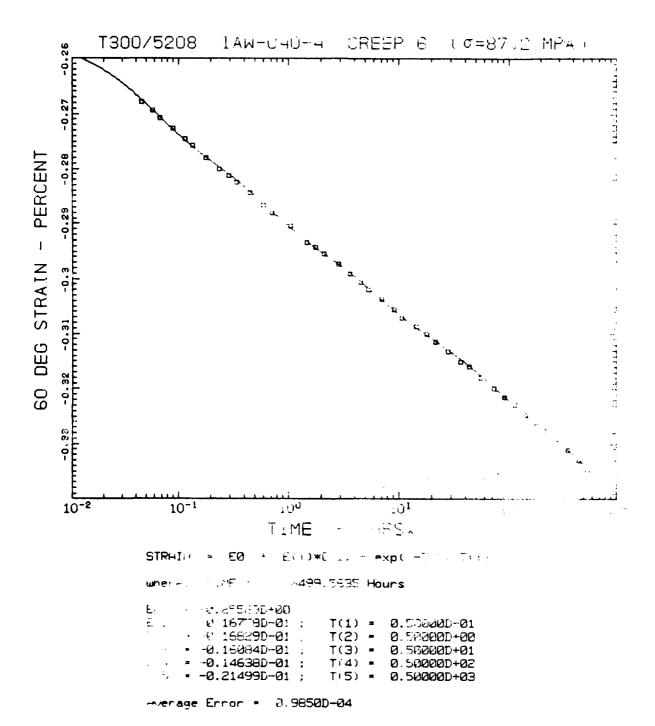


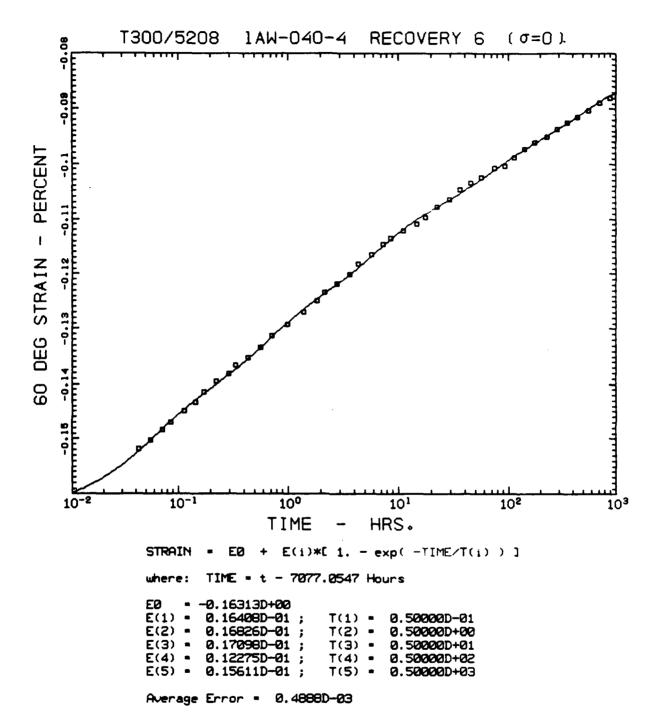


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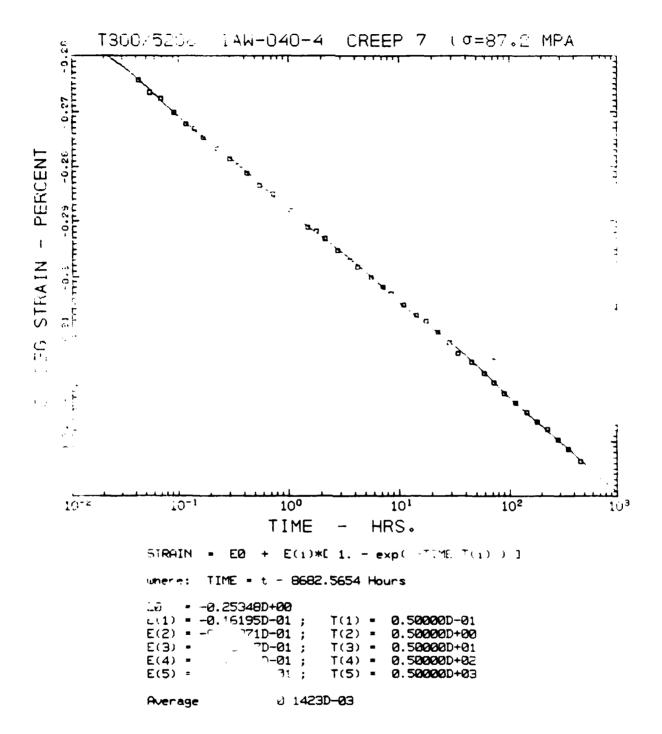


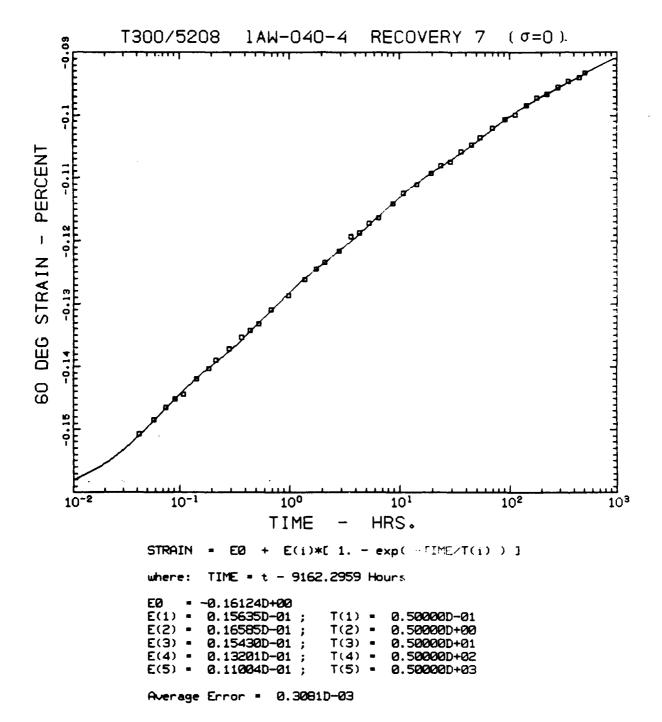


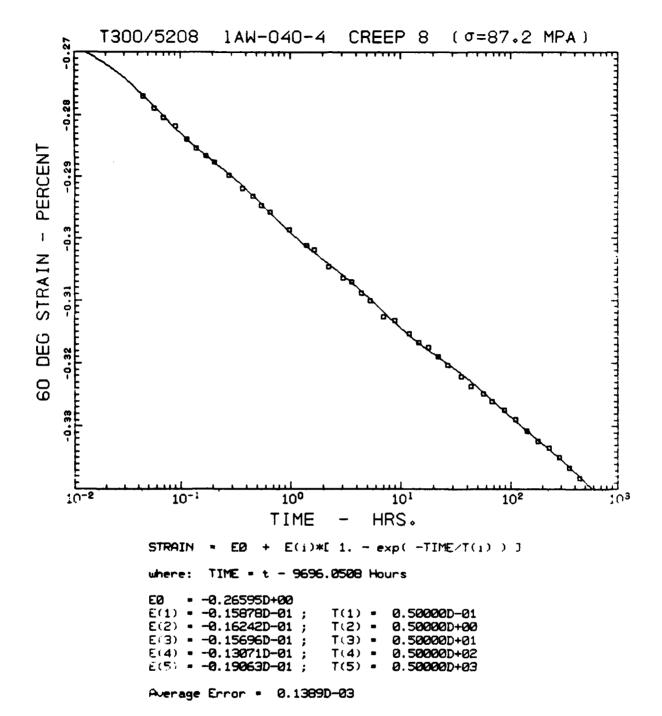


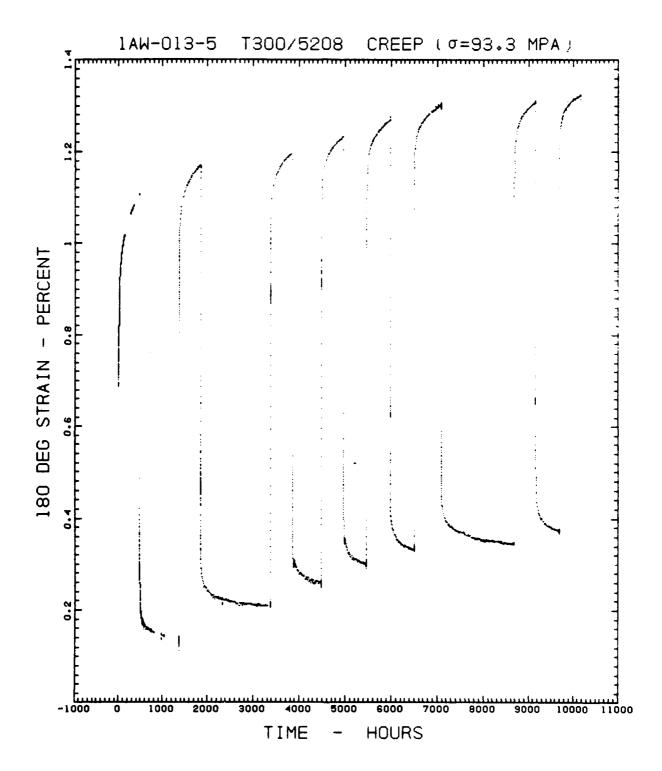


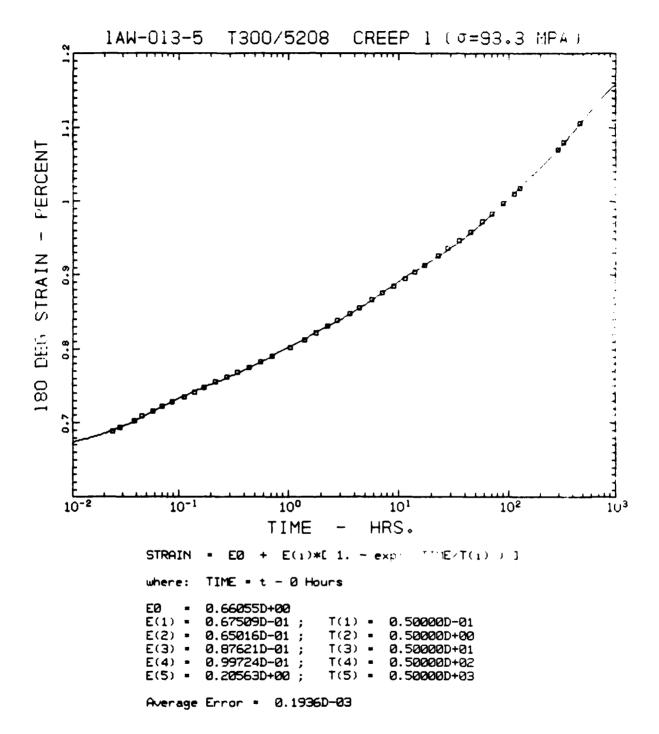
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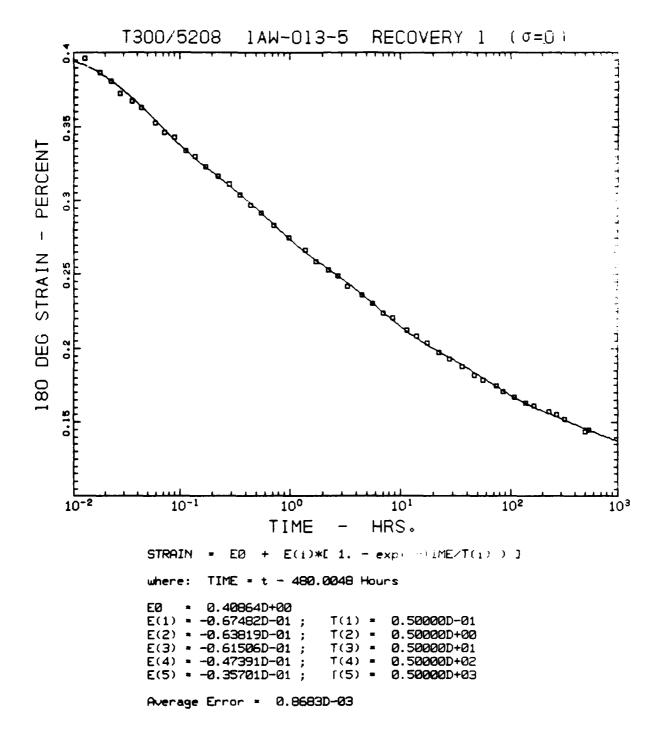


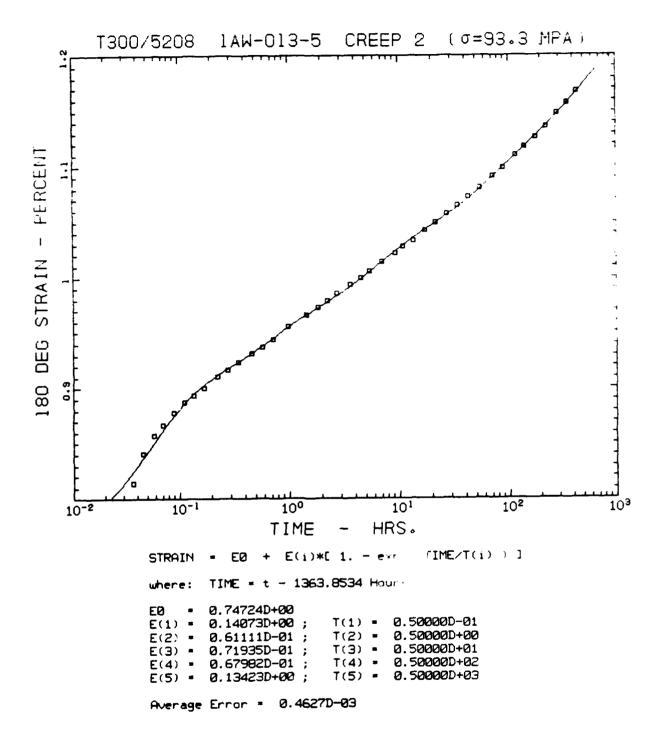


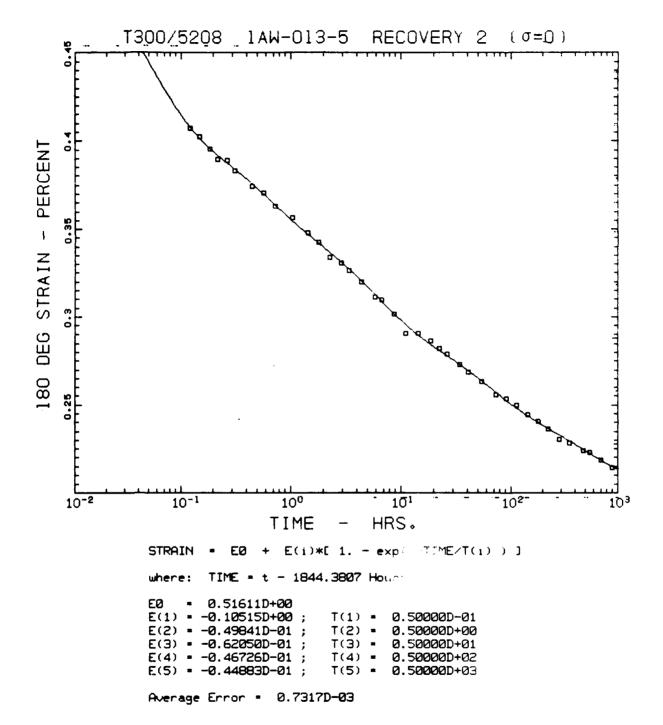


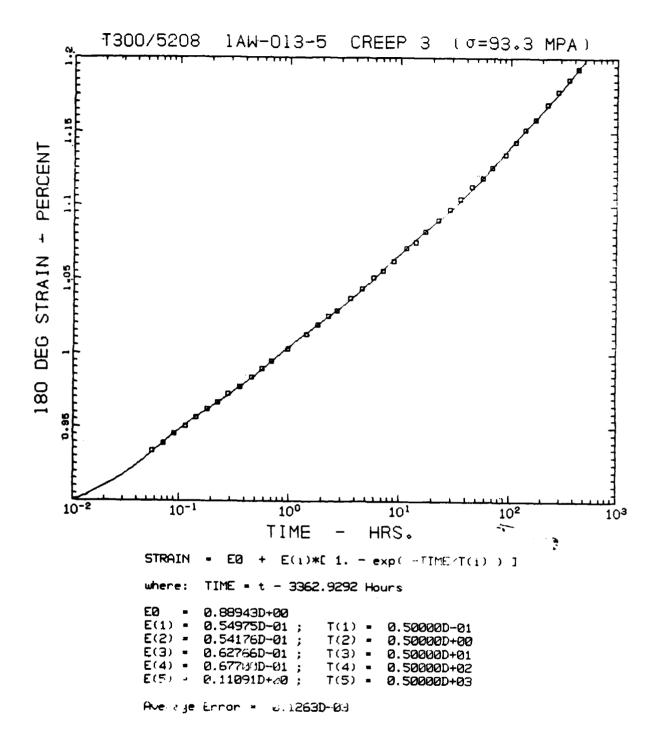


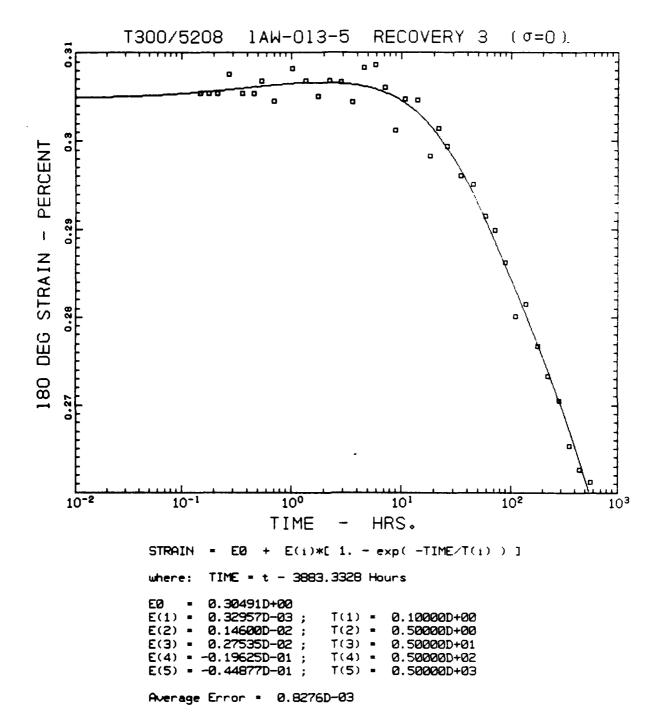


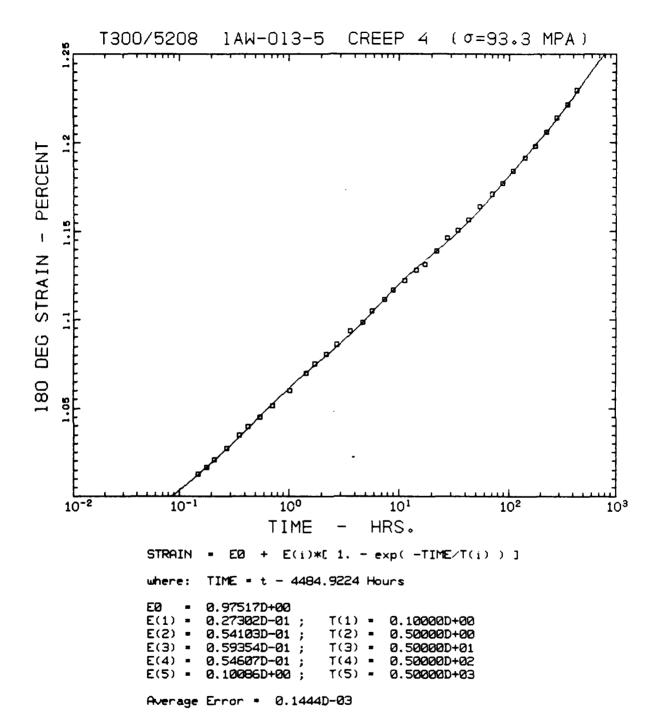












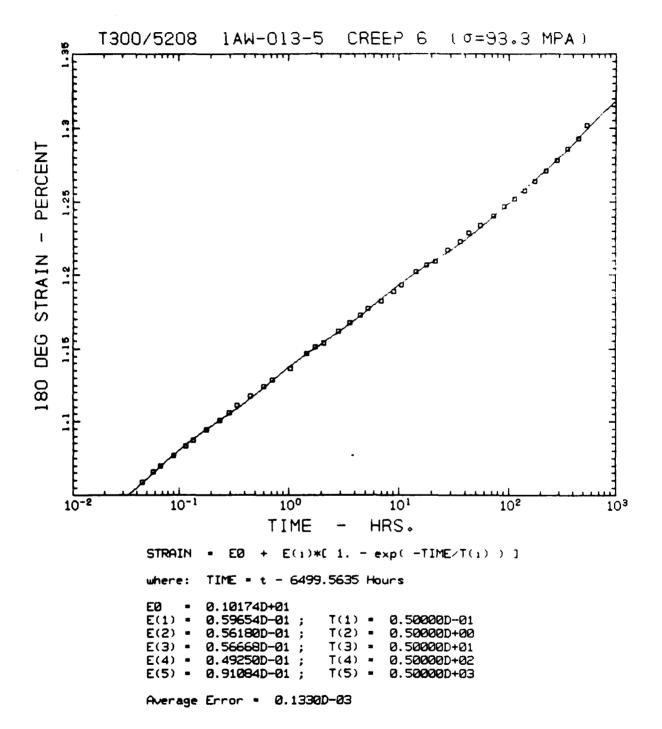
```
1AW-013-5 RECOVERY 4 (\sigma=0).
               T300/5208
180 DEG STRAIN
    0.3 0.31
                                          10<sup>0</sup>
     10-2
                       10-1
                                                             10<sup>1</sup>
                                                                                10<sup>2</sup>
                                                                                                   10<sup>3</sup>
                                        TIME
                                                         HRS.
                   STRAIN
                                          E(i)*[1. - exp(-TIME/T(i))]
                              TIME = t - 4987.0195 Hours
                   EØ
                             Ø.35790D+00
                   E(1) =
                             0.10922D-03;
                                                   T(1) =
                                                             0.10000D+00
                   E(2) = -0.28917D-02;
                                                   T(2) =
                                                             0.50000D+00
                   E(3) = 0.24898D-02;
E(4) = -0.30171D-01;
E(5) = -0.46794D-01;
                                                   T(3) =
                                                             0.50000D+01
                                                             0.50000D+02
0.50000D+03
                                                   T(4) =
                                                   T(5) =
```

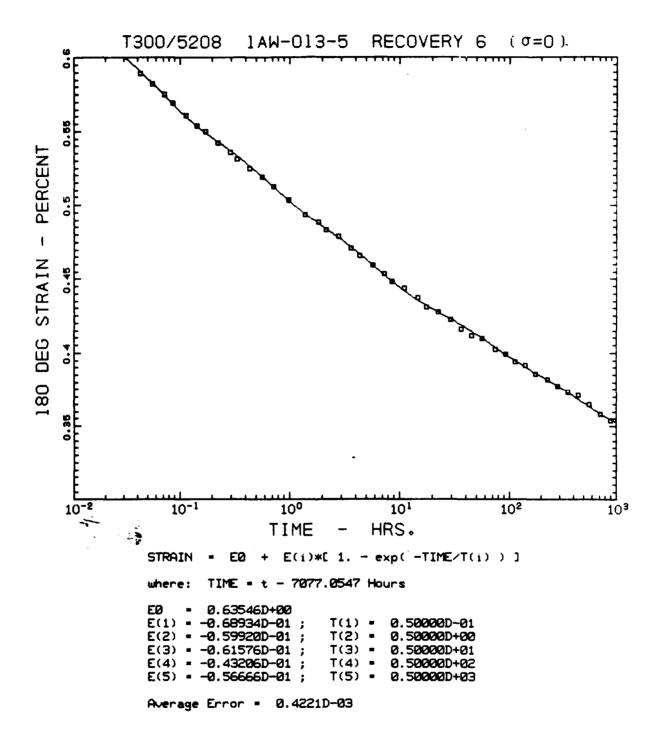
Average Error = 0.7875D-03

```
1AW-013-5 CREEP 5
            T300/5208
                                                                               \{\sigma = 93.3 \text{ MPA}\}
STRAIN
180 DEG
                                                                                         10<sup>2</sup>
                                                                                                             10<sup>3</sup>
      10-2
                          10-1
                                               10°
                                                                    10<sup>1</sup>
                                                               HRS.
                                            TIME
                     STRAIN
                                           + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                                 TIME = t - 5468.3433 Hours
                     E0 =
E(1) =
                                 0.97290D+00
                                0.72949D-01;
0.72949D-01;
0.53552D-01;
0.57778D-01;
0.48954D-01;
0.97897D-01;
                                                                   0.50000D-01
                                                        T(1) =
                     E(2) =
                                                        T(2) =
                                                                    0.50000D+00
                                                                   0.50000D+01
0.50000D+02
0.50000D+03
                     E(3) =
                                                        T(3) -
                     E(4) =
E(5) =
                                                        T(4) =
                                                        T(5) =
                     Average Error = 0.2676D-03
```

```
T300/5208
                               1AW-013-5 RECOVERY 5 (\sigma=0).
STRAIN
DEG
                                    10°
                                                     10<sup>1</sup>
                                                                     10<sup>2</sup>
                                                                                     10<sup>3</sup>
    10-2
                    10-1
                                   TIME
                                                 HRS.
                            EØ + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                 STRAIN
                          TIME = t - 5977.75 Hours
                         0.58992D+00
                                            T(1) =
T(2) =
                E(1) = -0.56409D-01;
                                                     0.50000D-01
                E(2) = -0.59856D-01;
                                                     0.50000D+00
                E(3) = -0.61401D-01;

E(4) = -0.44859D-01;
                                            T(3) =
                                                     0.50000D+01
                                            T(4) =
                                                     0.50000D+02
                E(5) = -0.54507D-01;
                                            T(5) =
                                                     0.50000D+03
                Average Error = 0.4465D-03
```

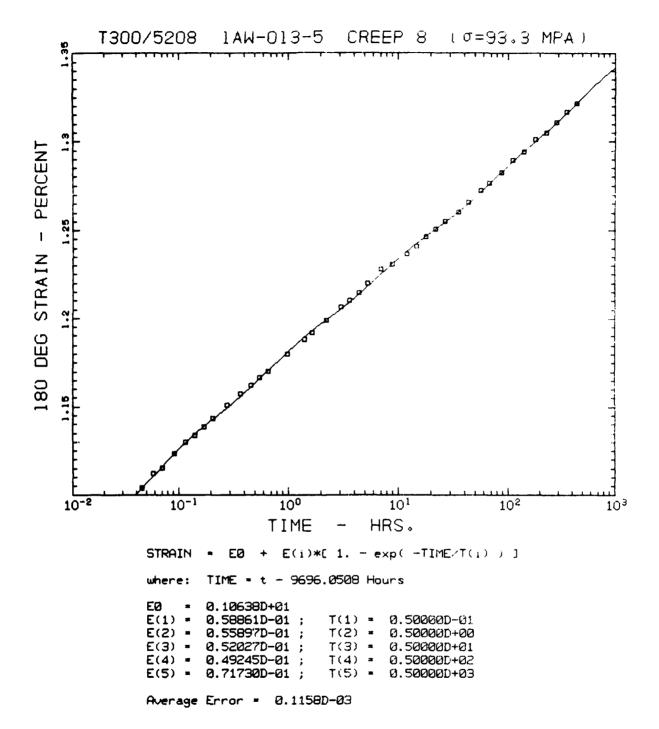


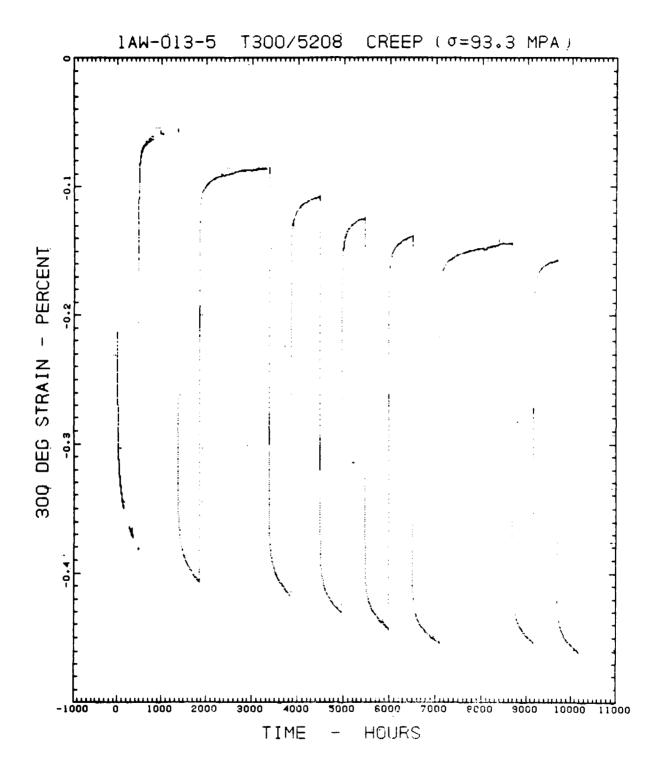


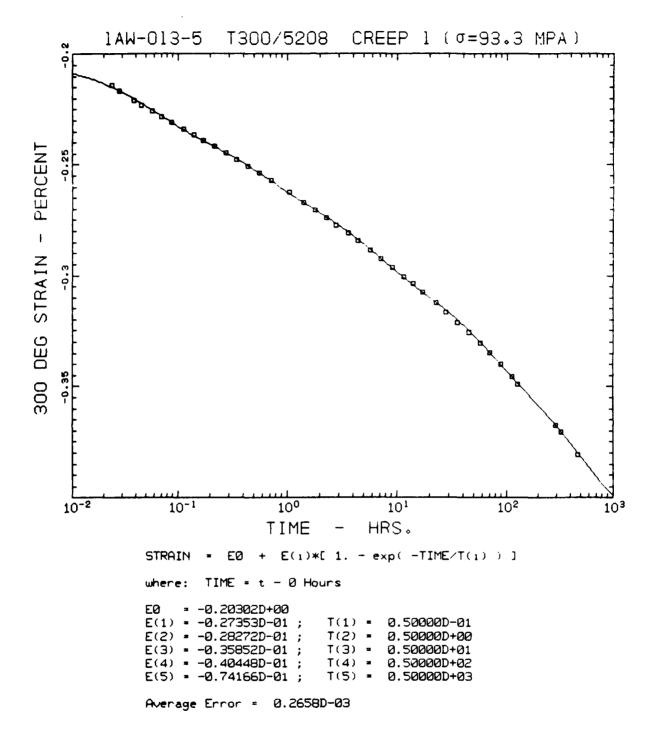
```
T300/5208
                               1AW-013-5 CREEP 7 (\sigma=93.3 MPA)
PERCENT
180 DEG STRAIN
                                        10°
                      10-1
     10-2
                                                           10¹
                                                                             10<sup>2</sup>
                                                                                               10<sup>3</sup>
                                                       HRS.
                                      TIME
                  STRAIN
                                     + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                            TIME = t - 8682.5654 Hours
                            0.10197D+01
0.60039D-01;
0.59676D-01;
0.55637D-01;
0.57842D-01;
                  EØ
                                                T(1) =
T(2) =
T(3) =
                  E(1) =
                                                           0.50000D-01
                                                           0.50000D+00
                                                           0.50000D+01
                  E(3) =
                  E(4) =
                                                 T(4) =
                                                           0.50000D+02
                  E(5) = 0.88612D-01;
                                                 T(5) -
                                                           0.50000D+03
                  Average Error = 0.1265D-03
```

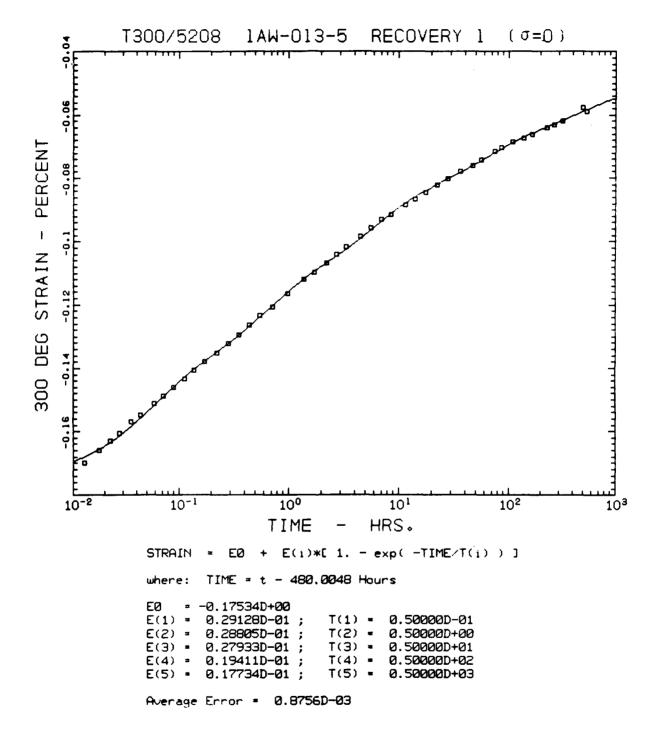
```
T300/5208
                                    1AW-013-5
                                                         RECOVERY 7
                                                                                 (\sigma=0)
- PERCENT
180 DEG STRAIN
     10-2
                       10^{-1}
                                          10<sup>0</sup>
                                                             10<sup>1</sup>
                                                                                10<sup>2</sup>
                                                                                                  10<sup>3</sup>
                                                         HRS.
                                        TIME
                   STRAIN
                                 EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                             TIME = t - 9162.2959 Hours
                   where:
                         - 0.62096D+00
                   EØ
                   E(1) = -0.54730D-01;
                                                             0.50000D-01
                                                   T(1) =
                   E(2) = -0.59028D-01;
                                                   T(2) =
                                                             0.50000D+00
                   E(3) = -0.53635D-01;
E(4) = -0.46259D-01;
E(5) = -0.51459D-01;
                                                   T(3) =
                                                             0.50000D+01
                                                             0.50000D+02
0.50000D+03
                                                   T(4) =
                                                   T(5) =
```

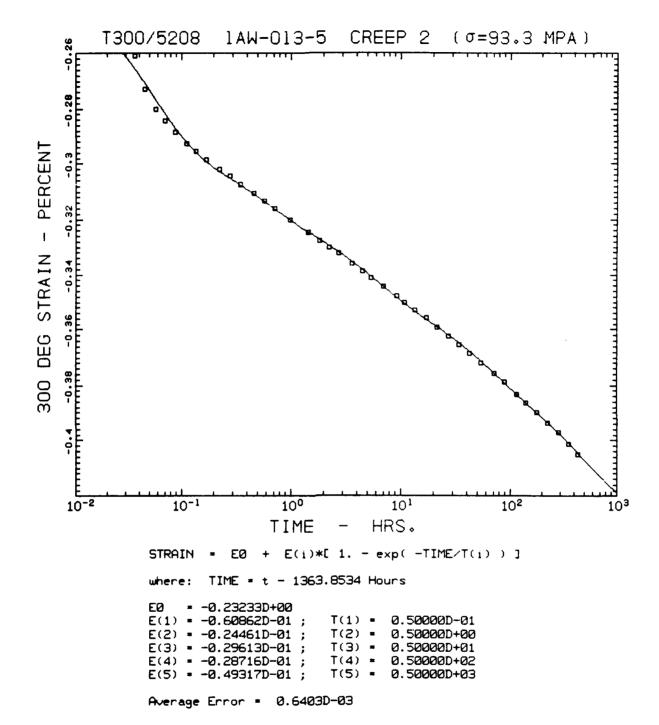
Average Error = 0.2636D-03

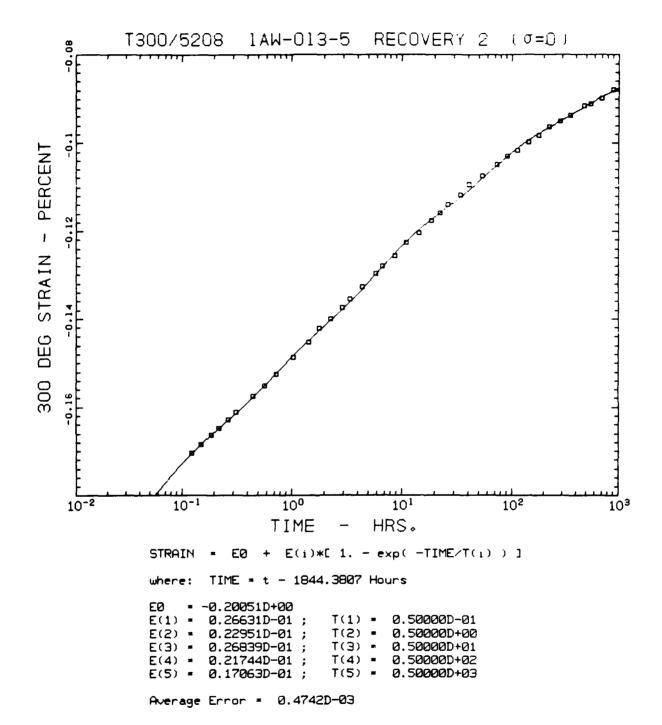






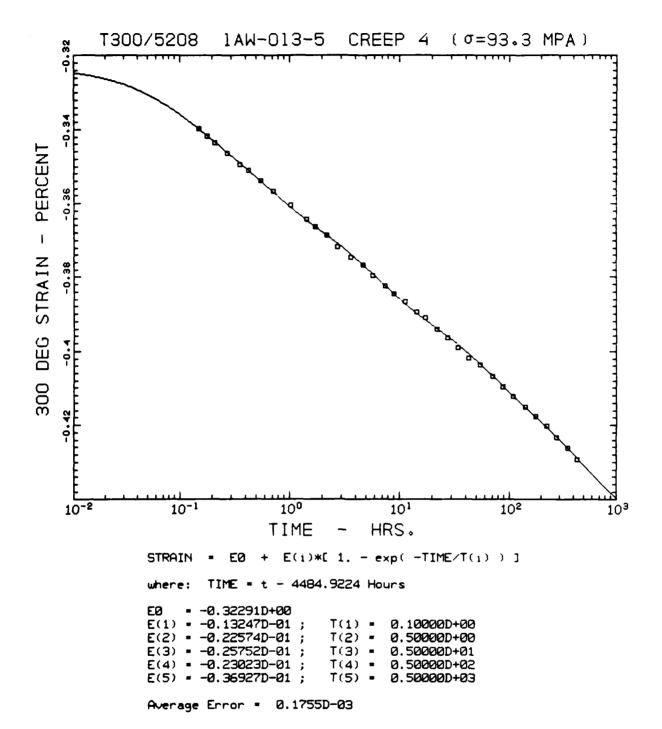


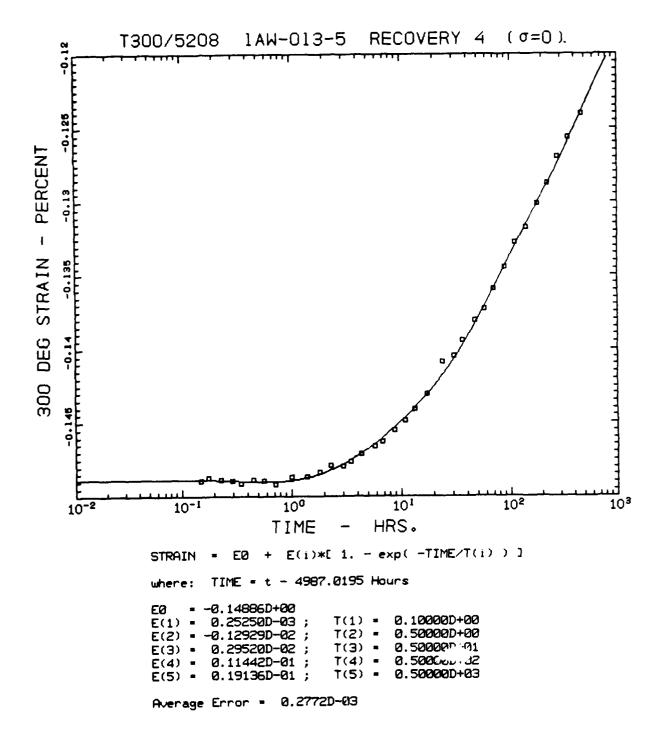




```
T300/5208
                          1AW-013-5
                                            CREEP 3 (\sigma=93.3 MPA)
PERCENT
STRAIN
DEG
300
    10-2
                   10^{-1}
                                   10°
                                                  10<sup>1</sup>
                                                                  10<sup>2</sup>
                                                                                 10<sup>3</sup>
                                 TIME
                                               HRS.
                STRAIN
                           EØ + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                        TIME = t - 3362.9292 Hours
                where:
                     - -0.28818D+00
                                                  0.50000D-01
                E(1) = -0.23492D-01;
                                          T(1) =
                E(2) = -0.23072D-01;
                                          T(2) =
                                                  0.50000D+00
                E(3) = -0.27072D-01;
                                          T(3) =
                                                  0.50000D+01
                E(4) = -0.27211D-01;
                                          T(4) =
                                                  0.50000D+02
                E(5) = -0.45580D-01;
                                          T(5) -
                                                  0.50000D+03
                Average Error = 0.1296D-03
```

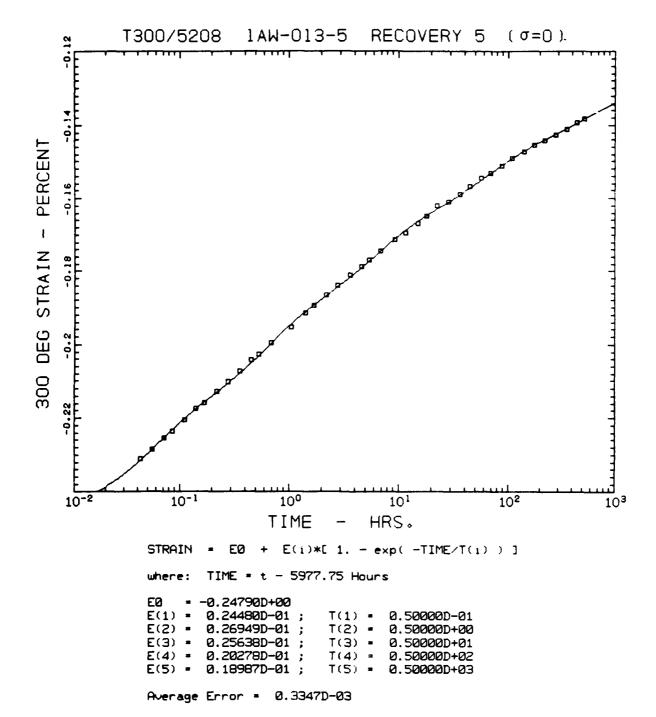
```
T300/5208
                                 1AW-013-5
                                                    RECOVERY 3
                                                                        (\sigma=0).
PERCENT
300 DEG STRAIN
     10-2
                                      10°
                                                       101
                     10-1
                                                                         10<sup>2</sup>
                                                                                         10<sup>3</sup>
                                    TIME
                                                    HRS.
                           = EØ + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                         TIME = t - 3883.3328 Hours
                  where:
                       - ~0.12865D+00
                  E0
                  E(1) = -0.13759D-02;
                                              T(1) =
                                                       0.10000D+00
                          0.19817D-03;
0.59918D-03;
0.86080D-02;
0.19021D-01;
                                              T(2) =
                                                       0.50000D+00
                  E(2) =
                                                       0.50000D+01
                 E(3) =
                                              T(3) =
                  E(4) =
                                              T(4) =
T(5) =
                                                       0.50000D+02
                 E(5) =
                                                       0.50000D+03
                 Average Error = 0.3303D-03
```



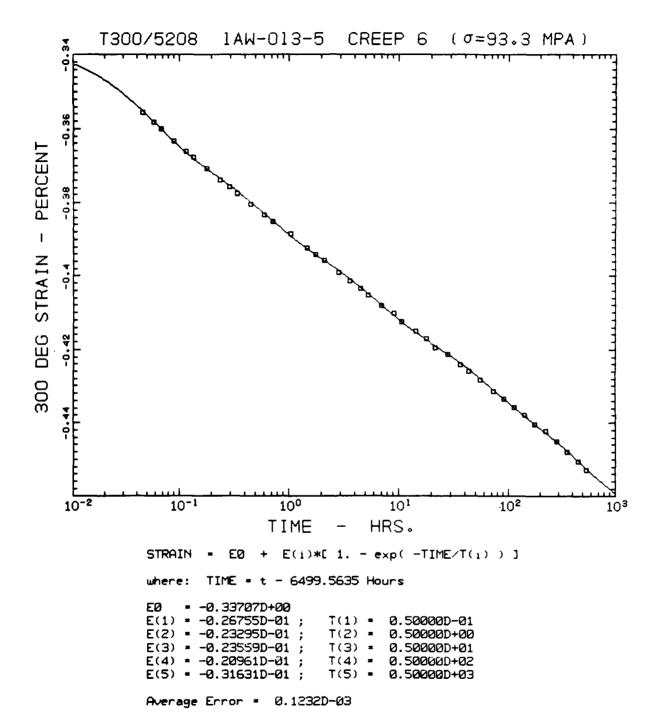


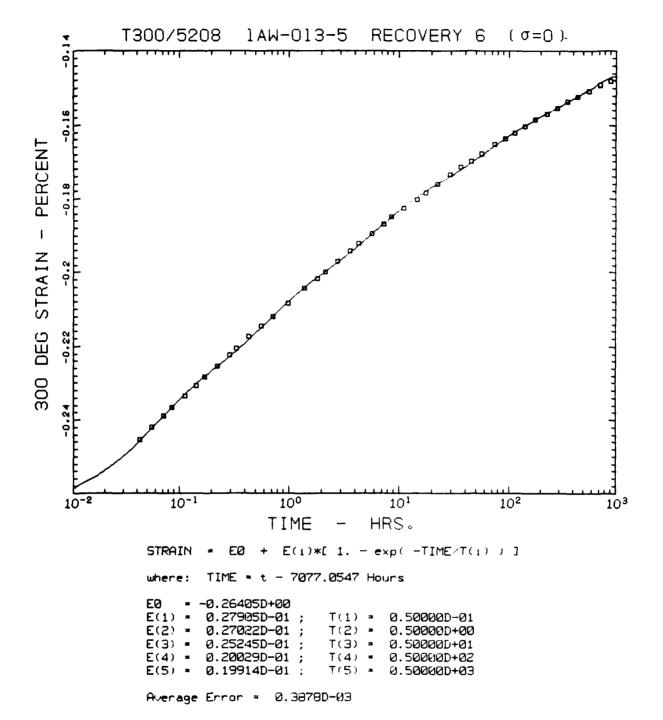
```
T300/5208
                          1AW-013-5 CREEP 5 (\sigma=93.3 MPA)
PERCENT
300 DEG
                                   10°
                   10-1
                                                  101
                                                                  10<sup>2</sup>
    10-2
                                                                                 10<sup>3</sup>
                                 TIME
                                               HRS.
                STRAIN = EØ + E(i)*[ 1. - \exp(-TIME/T(i)) ]
                       TIME = t - 5468.3433 Hours
                EØ
                     - -0.32176D+00
                E(1) = -0.31133D-01;
                                          T(1) =
                                                  0.50000D-01
                E(2) = -0.22417D-01;

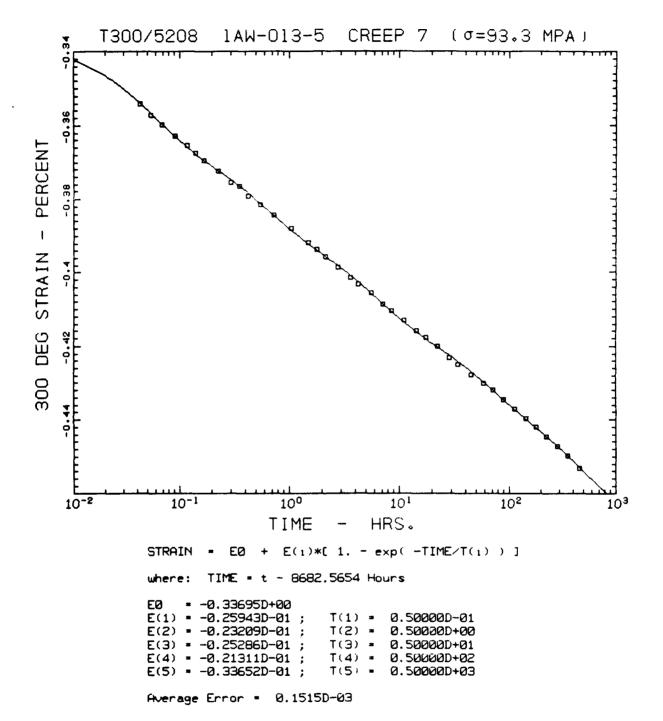
E(3) = -0.24988D-01;
                                          T(2) =
                                                  0.50000D+00
                                          T(3) =
                                                  0.50000D+01
                E(4) = -0.19698D - 01;
                                                  0.50000D+02
                                          T(4) =
                E(5) = -0.35059D-01;
                                          T(5) =
                                                  0.50000D+03
                Average Error = 0.3171D-03
```



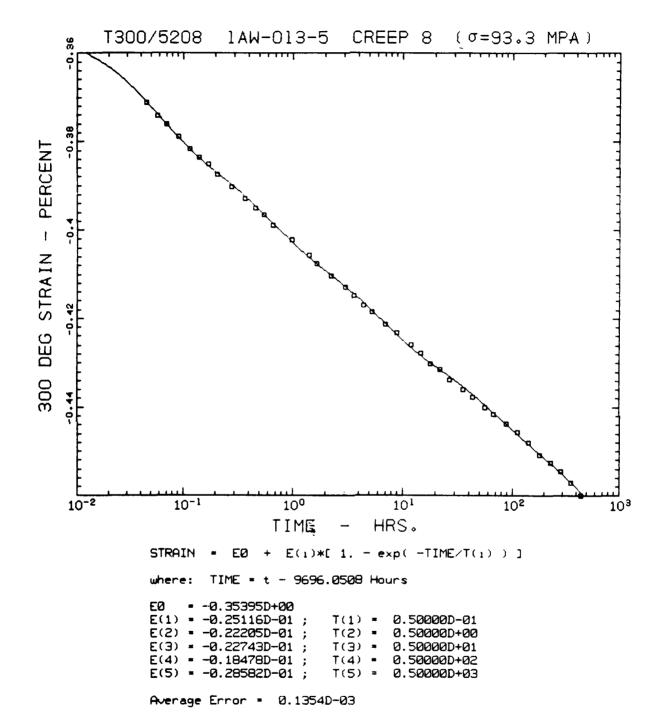
TOTAL TELEVISION OF THE PROPERTY OF THE PROPER

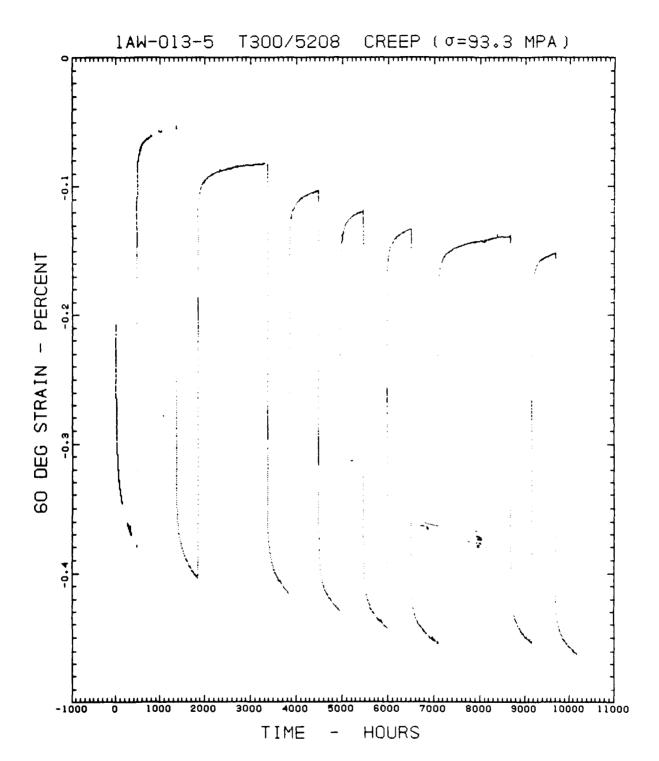


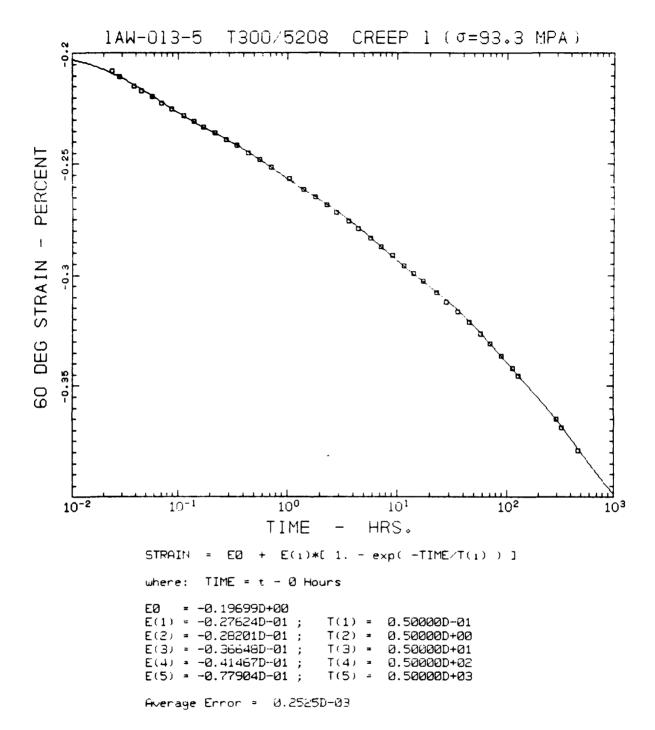




```
T300/5208
                                 1AW-013-5 RECOVERY 7 (\sigma=0)
PERCENT
STRAIN
DEG
300
                                                                                             10<sup>3</sup>
                                        10°
                                                                            10<sup>2</sup>
     10-2
                      10^{-1}
                                                          10<sup>1</sup>
                                      TIME
                                                      HRS.
                  STRAIN
                               EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                            TIME = t - 9162.2959 Hours
                  where:
                  EØ
                        - -0.25808D+00
                           0.21618D-01;
                                                          0.50000D-01
                  E(1) =
                                                T(1) =
                           0.25652D-01;
0.23388D-01;
0.20323D-01;
0.15788D-01;
                  E(2) =
                                                T(2) =
                                                          0.50000D+00
                  E(3) =
                                                T(3) -
                                                          0.50000D+01
                                               T(4) =
T(5) =
                                                         0.50000D+02
0.50000D+03
                  E(4) =
                  E(5) =
                  Average Error = 0.2082D-03
```

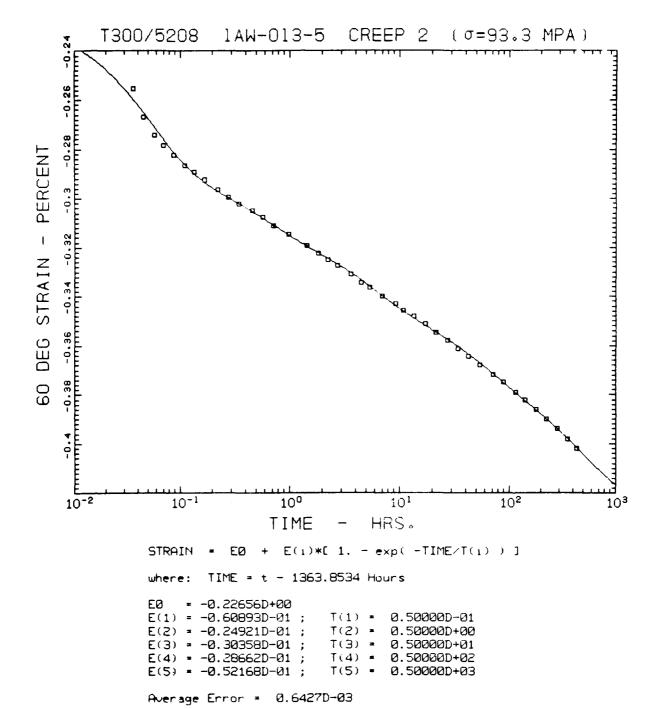


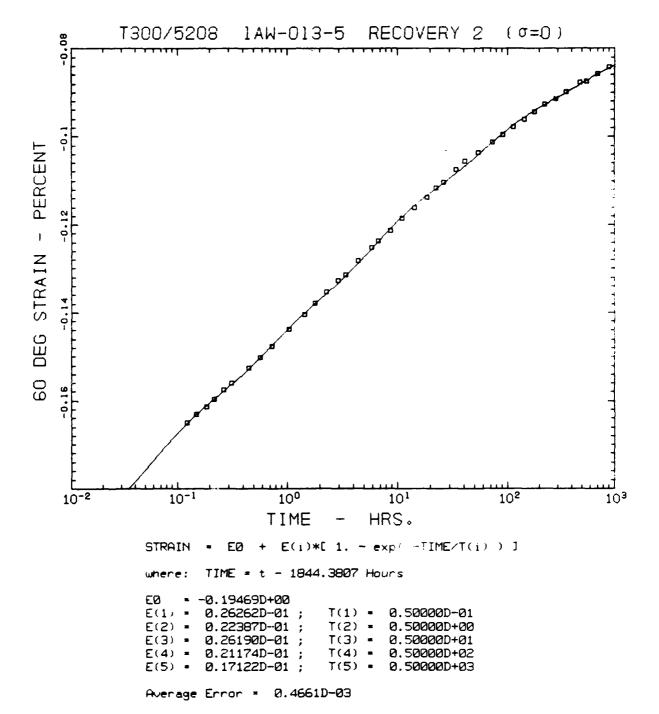


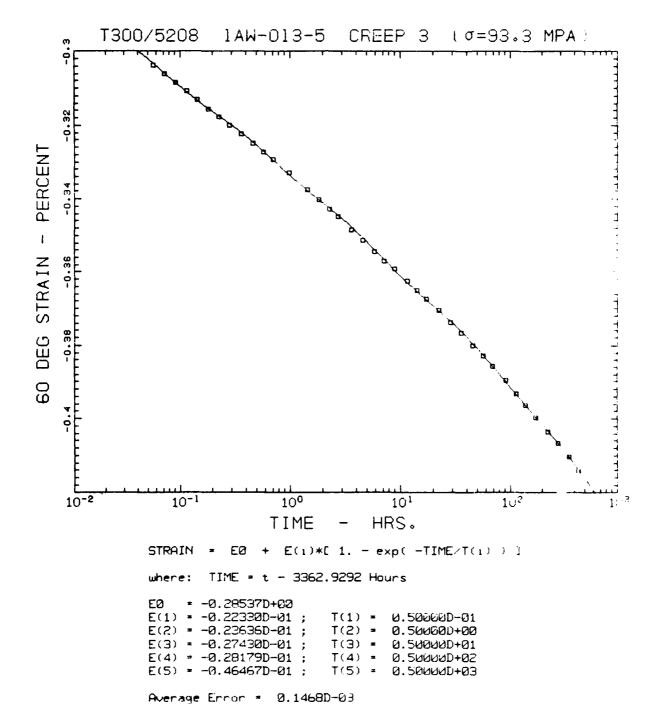


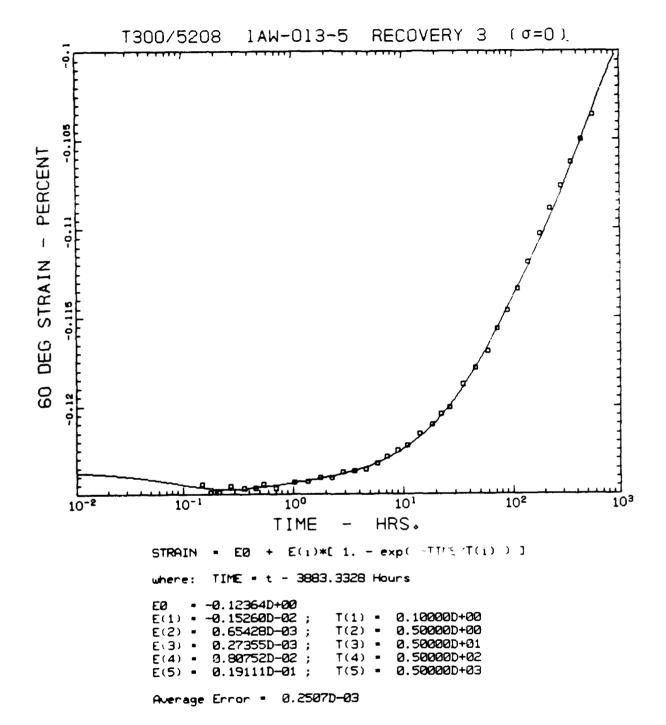
```
T300/5208
                                  1AW-013-5 RECOVERY 1 (\sigma=0)
PERCENT
STRAIN
930 09
                                                            10<sup>1</sup>
                       10-1
                                          10<sup>0</sup>
                                                                                10<sup>2</sup>
     10-2
                                                                                                  10<sup>3</sup>
                                        TIME
                                                         HRS.
                             = E0 + E(1)*[ 1. - exp(-TIME/T(1)) ]
                             TIME = t - 480.0048 Hours
                         - -0.17173D+00
- 0.29061D-01;
                   E0
                   E(1) =
                                                            0.50000D-01
                                                  T(1) =
                   E(2) =
E(3) =
                             0.27358D-01;
                                                  T(2) =
                                                            0.50000D+00
                             0.27423D-01;
0.18805D-01;
0.18333D-01;
                                                  T(3) =
                                                            0.50000D+01
                                                  T(4) = 0.50000D+02

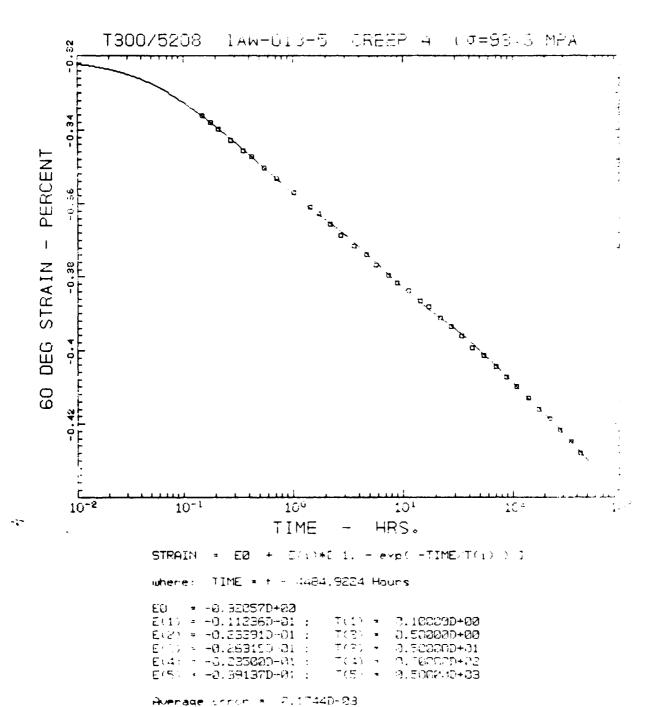
T(5) = 0.50000D+03
                   Average Error * 0.6799D-03
```

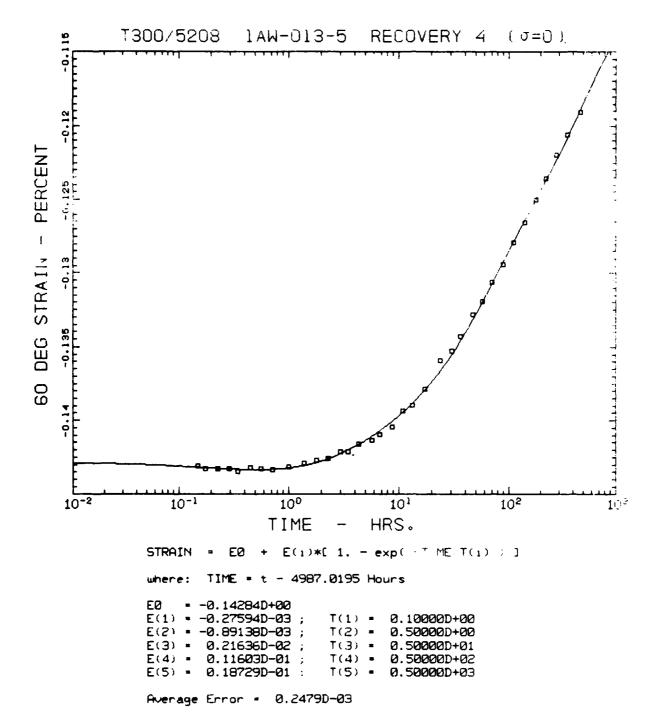


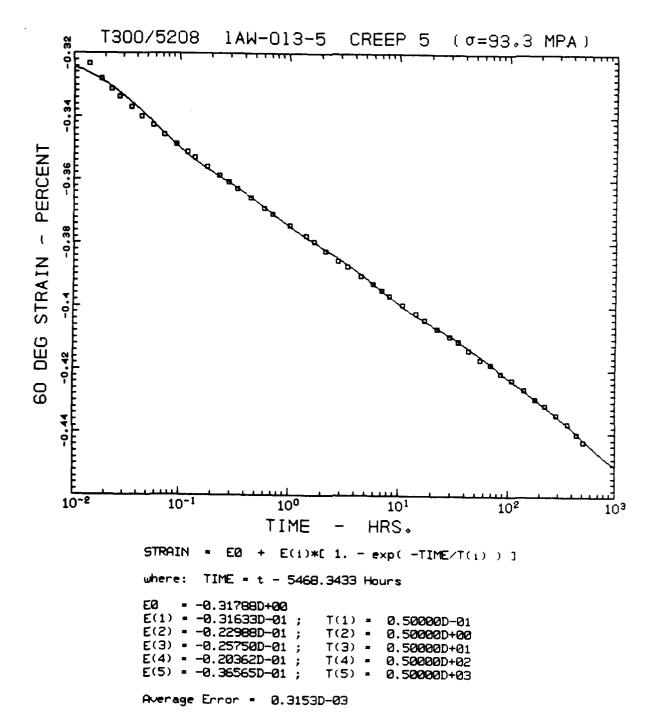


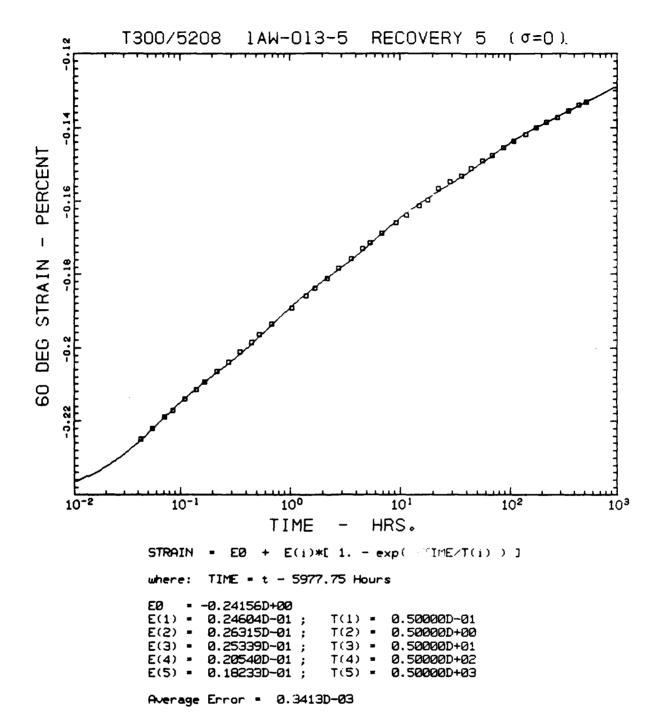


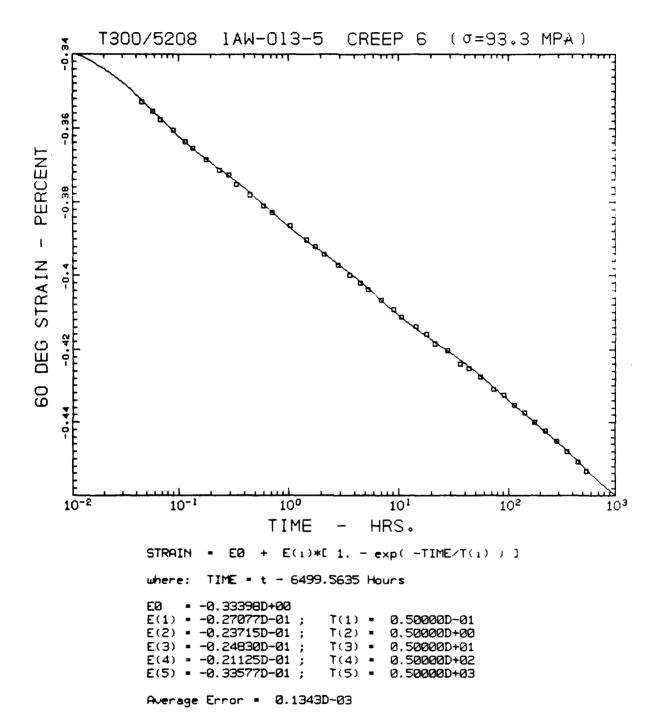


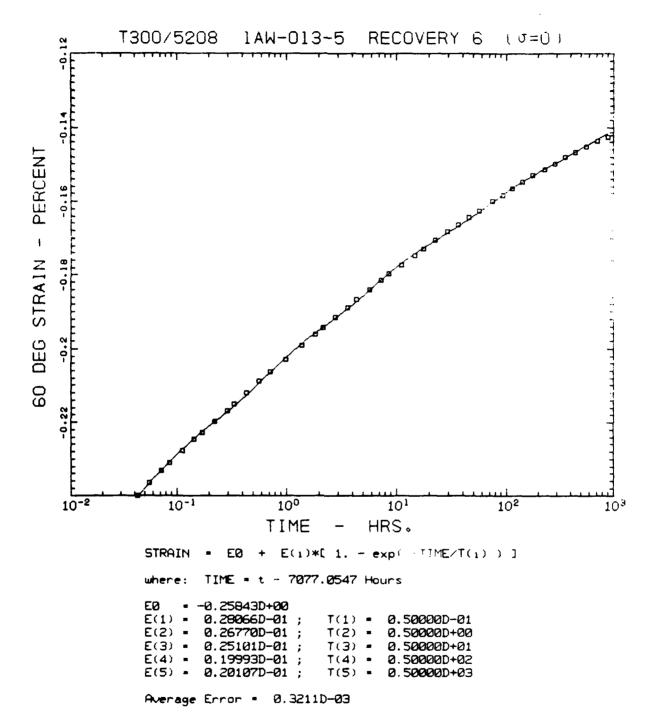


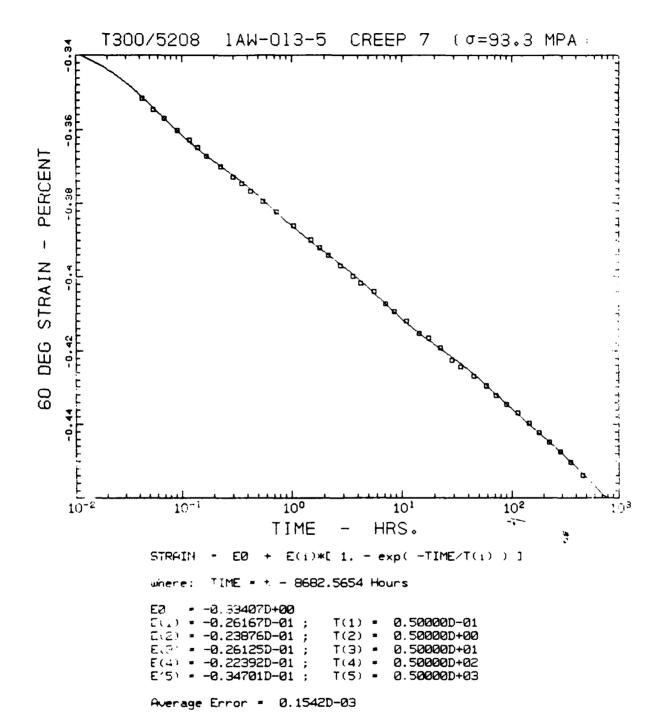




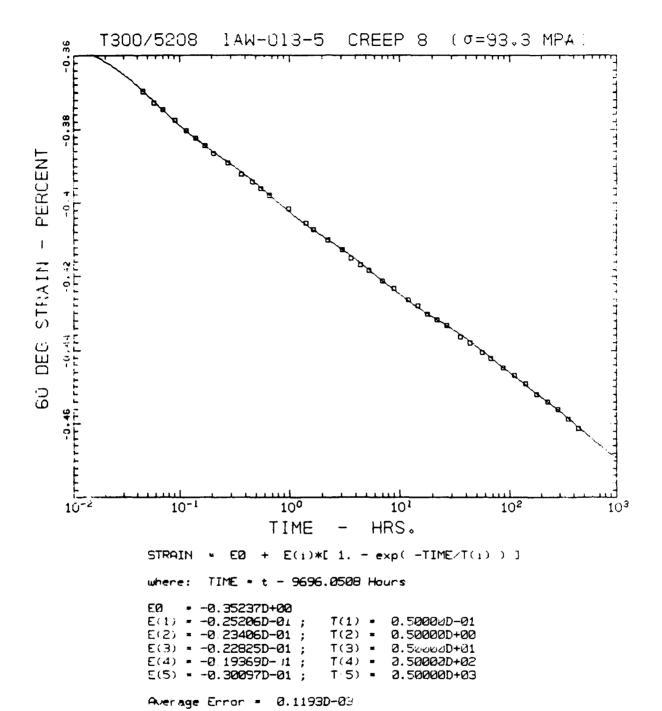


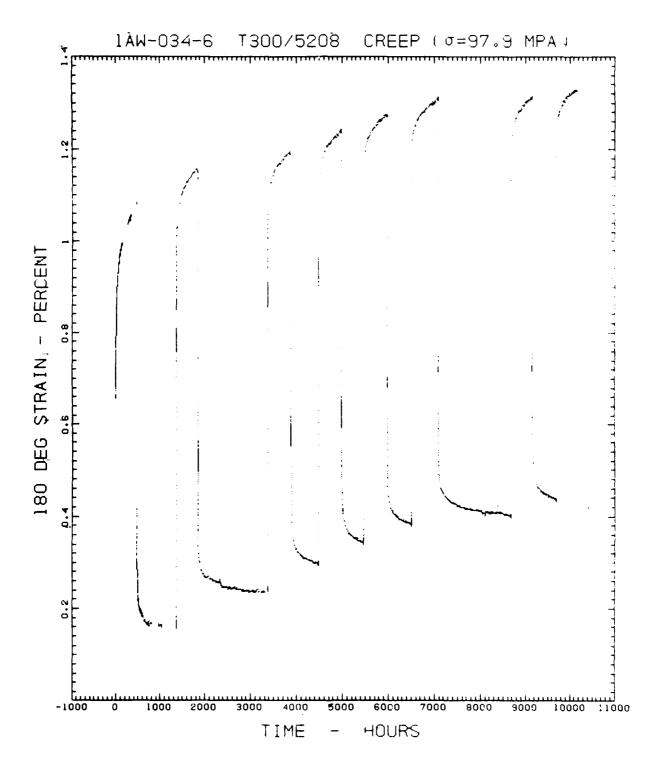


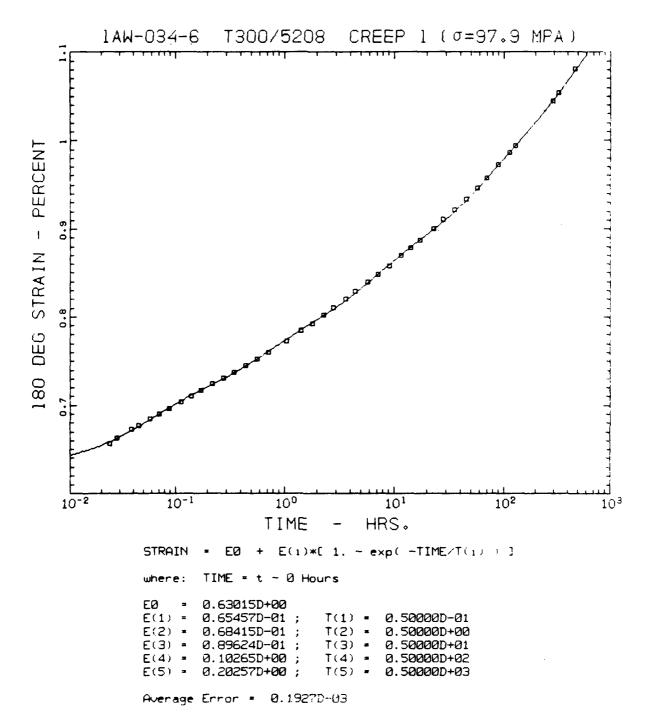


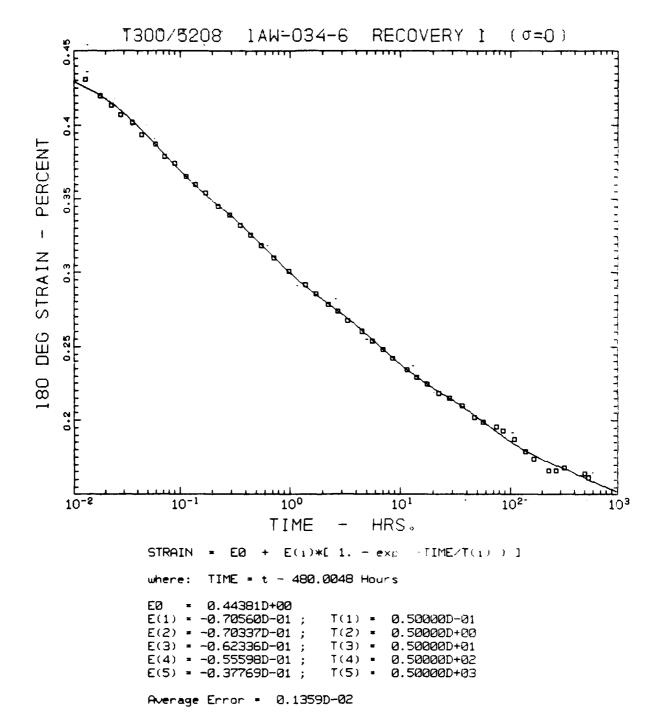


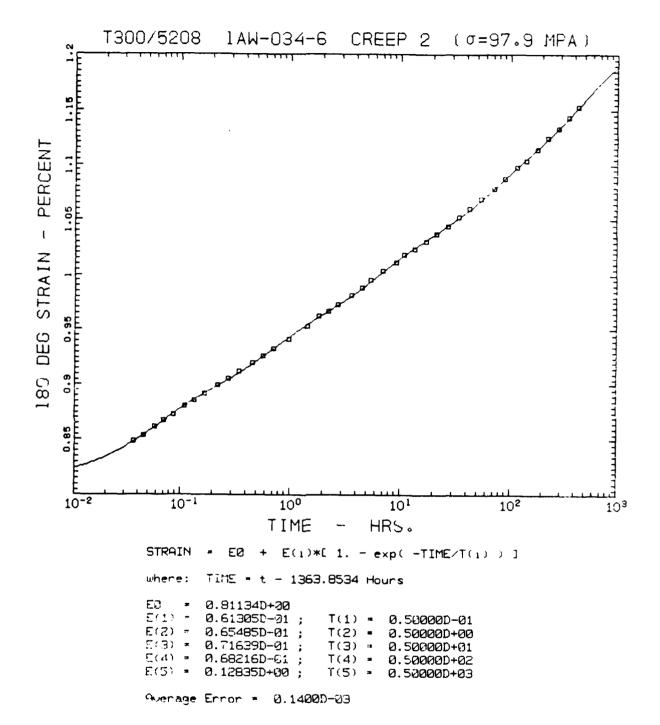
```
T300/5208
                             1AW-013-5
                                               RECOVERY 7
                                                                   (\sigma=0)
- PERCENT
DEG STRAIN
    10-2
                   10-1
                                   10°
                                                                  10<sup>2</sup>
                                                  10¹
                                                                                 105
                                 TIME
                                               HRS.
                           E0 + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                STRAIN
                        TIME = t - 9162.2959 Hours
                where:
                     - -0.25345D+00
                ΕØ
                        0.22862D-01;
0.25431D-01;
                E(1) =
                                         T(1) =
                                                  0.50000D-01
                                                  0.50000D+00
                E(2) =
                                         T(2) =
                E(3) =
                        0.22971D-01;
                                         T(3) -
                                                  0.50000D+01
                E(4) =
E(5) =
                        0.20238D-01;
                                         T(4) = 0.50000D+02
                        0.15588D-01;
                                         T(5) = 0.50000D+03
                Average Error = 0.2320D-03
```

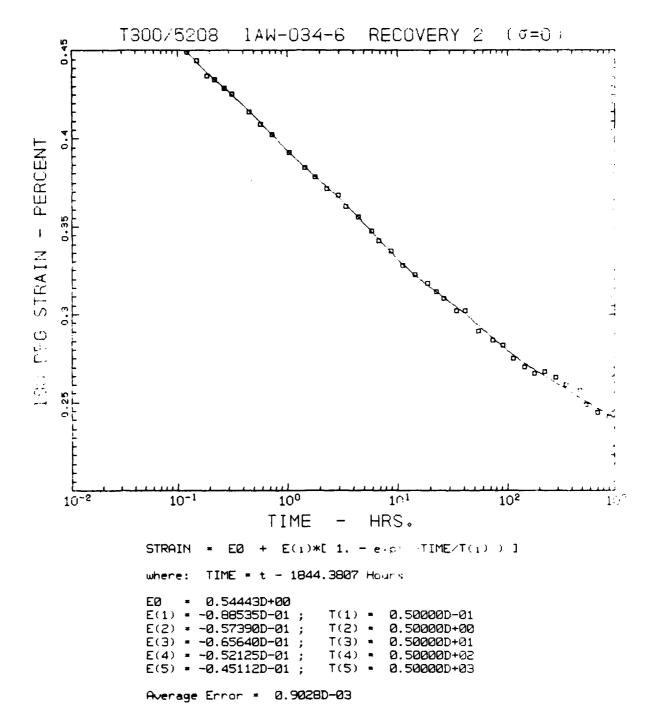


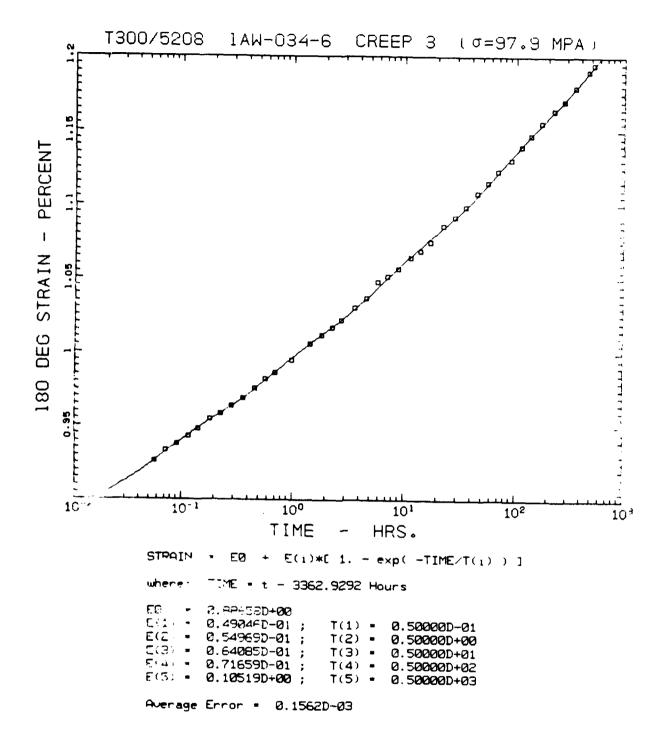


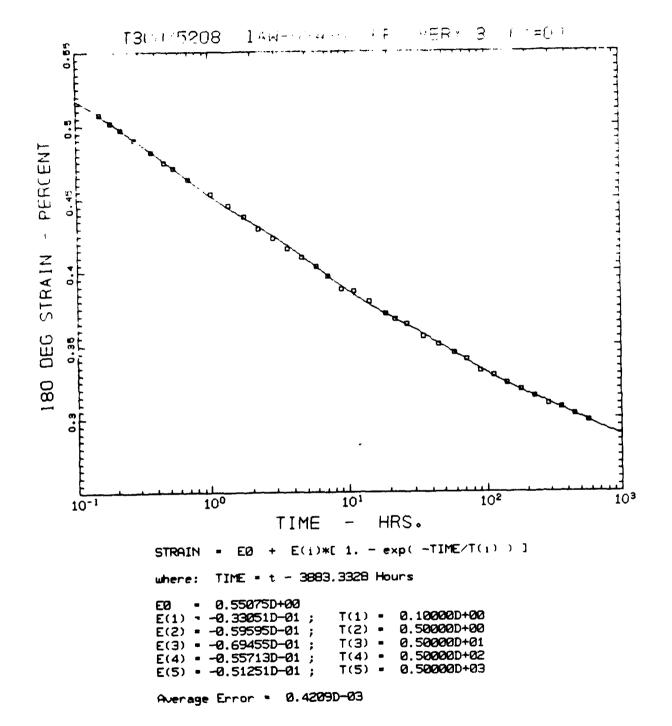


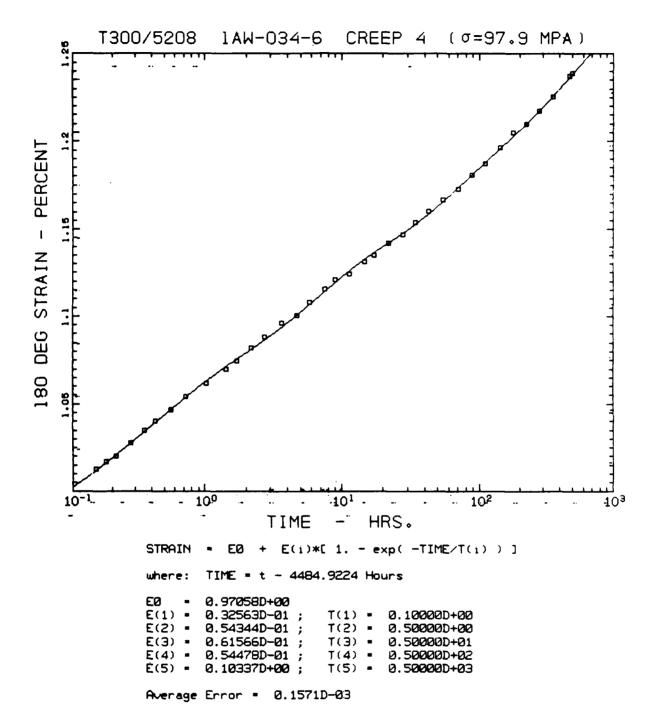


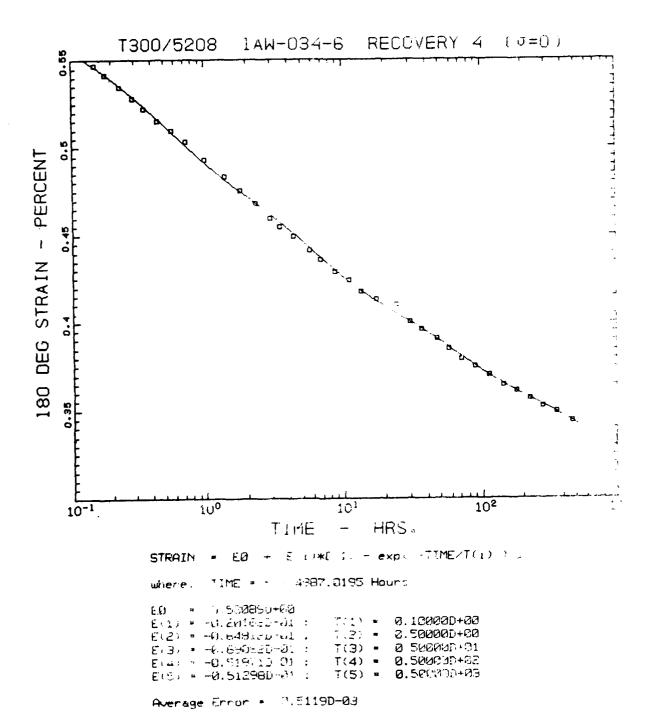




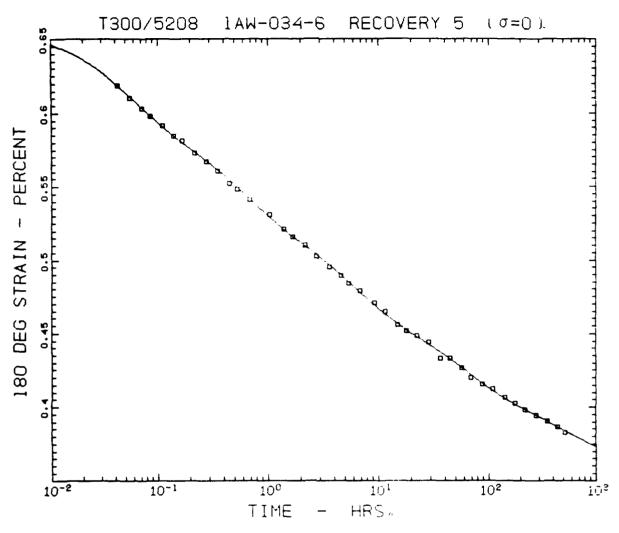








```
1AW-034-6
                                                   CREEP 5
                                                                 (\sigma = 97.9 \text{ MPA})
          T300/5208
PERCENT
STRAIN
180 DEG
                                        10°
     10-2
                      10-1
                                                                            10<sup>2</sup>
                                                          10<sup>1</sup>
                                                                                             10<sup>3</sup>
                                      TIME
                                                      HRS.
                                    + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                  STRAIN
                            TIME = t - 5468.3433 Hours
                  where:
                            0.97518D+00
0.76331D-01;
0.51701D-01;
                  EØ
                  E(1) =
                                                T(1) =
                                                          0.50000D-01
                  E(2) =
                                                T(2) =
                                                          0.50000D+00
                  E(3) =
                            0.65393D-01;
                                                T(3) =
                                                          0.50000D+01
                            0.44247D-01;
0.96324D-01;
                  E(4) =
E(5) =
                                                T(4) =
                                                          0.50000D+02
                                                T(5) -
                                                          0.50000D+03
                  Average Ennor = 0.2299D-03
```



EØ + E(i)*[1. - exp(-TIME \times T(i))] STRAIN

TIME = t - 5977.75 Hours where:

0.65900D+00

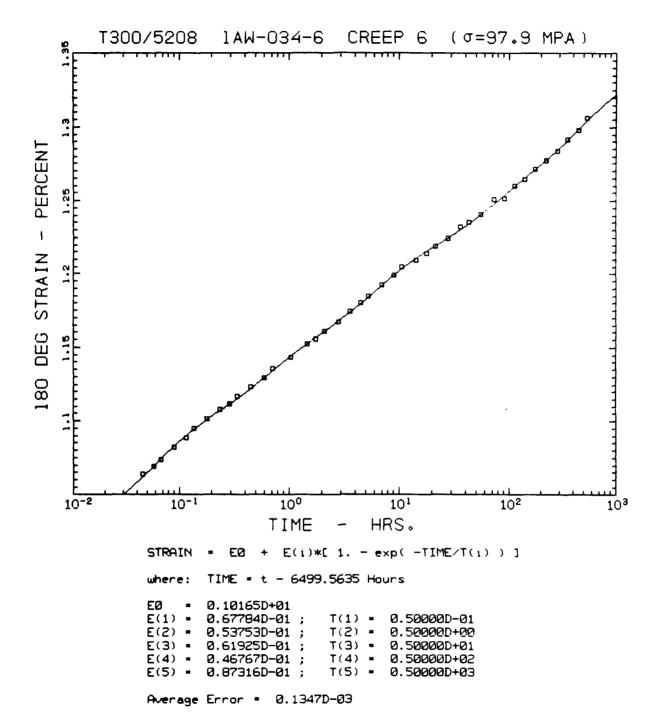
E(1) = -0.60705D-01: 0.50000D-01 T(1) =

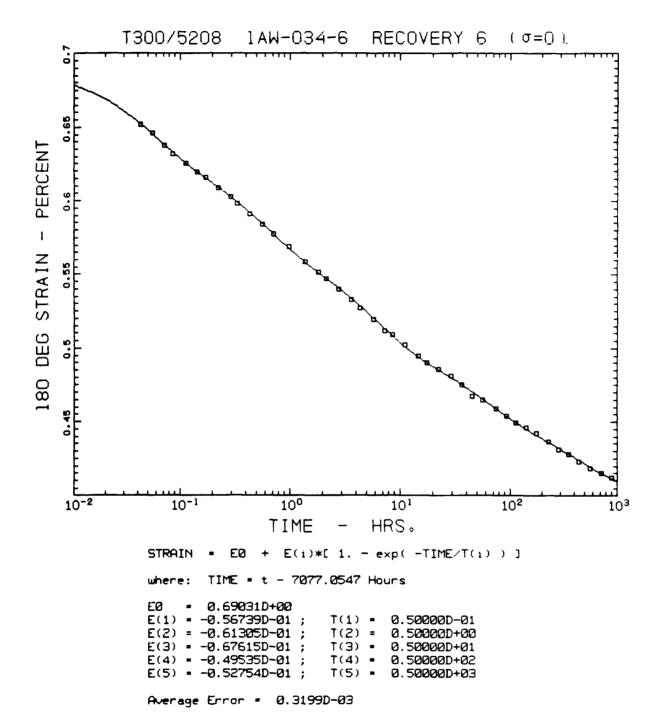
T(2) * 0.50200D+00 E(2) = -0.63714D-01;

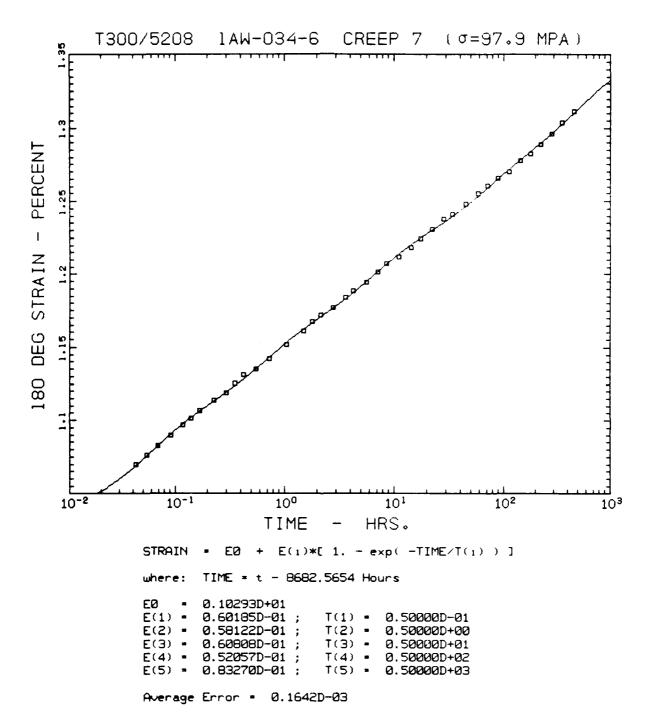
E(3) = -0.65898D-01 . 0.50000D+01

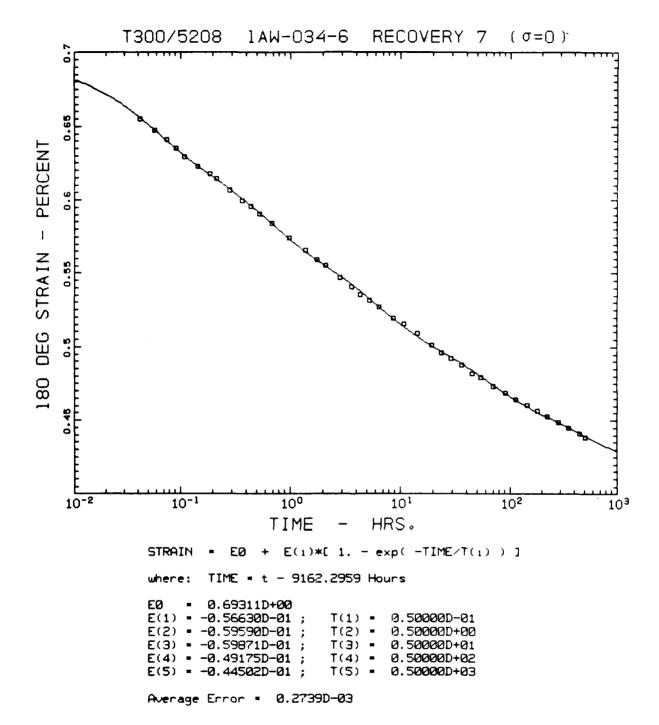
T/4, . E(4) = -0.54419D-01: 0.50000D+02 E(5) = -0.47153D-31. 3.50000D+03

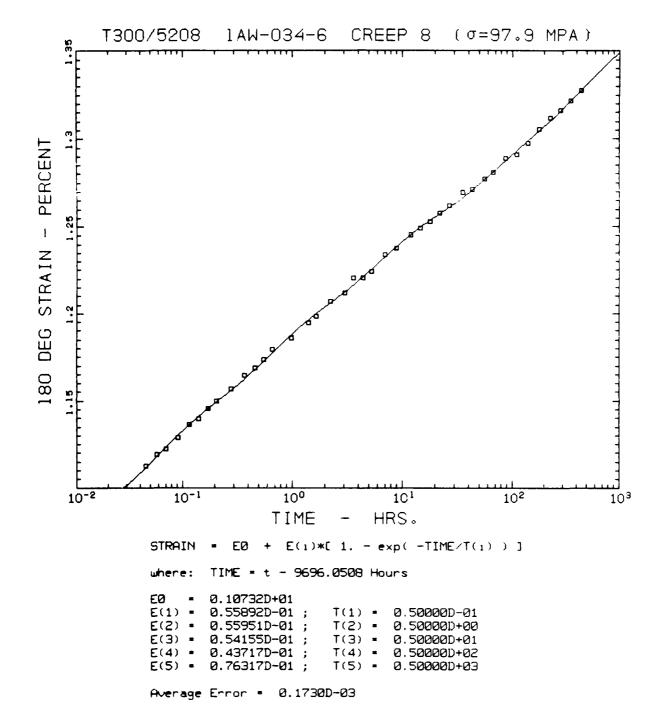
Average Ennon + 3.37890-83

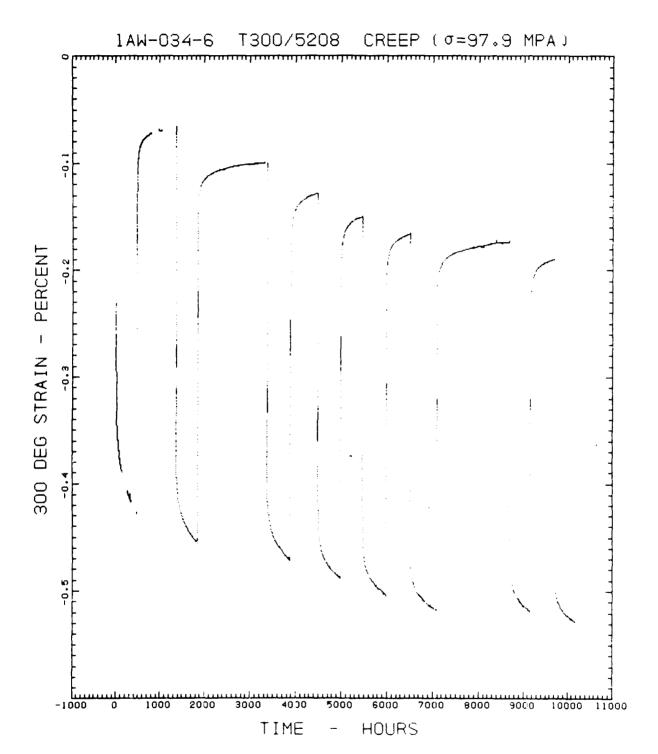




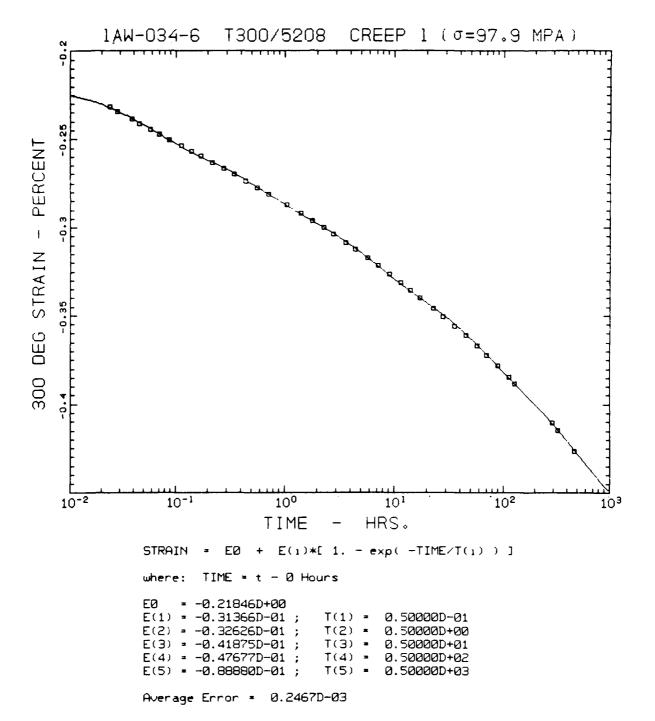


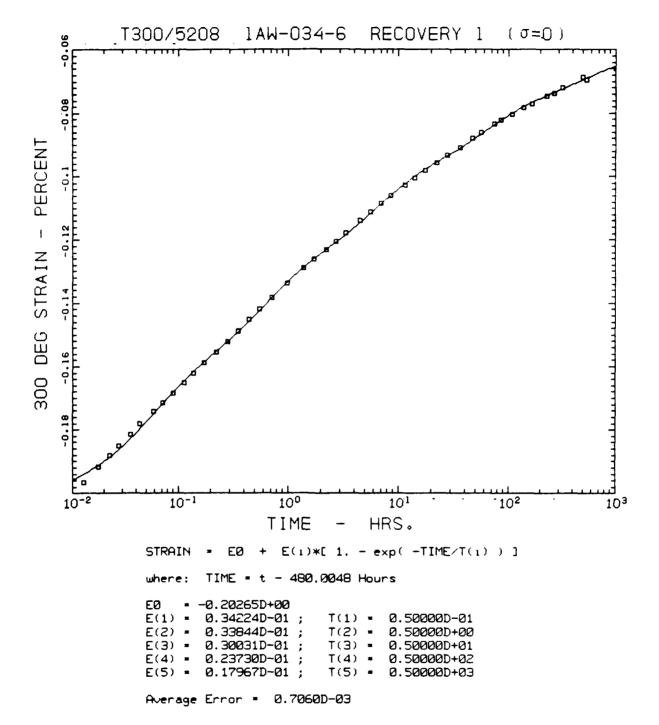


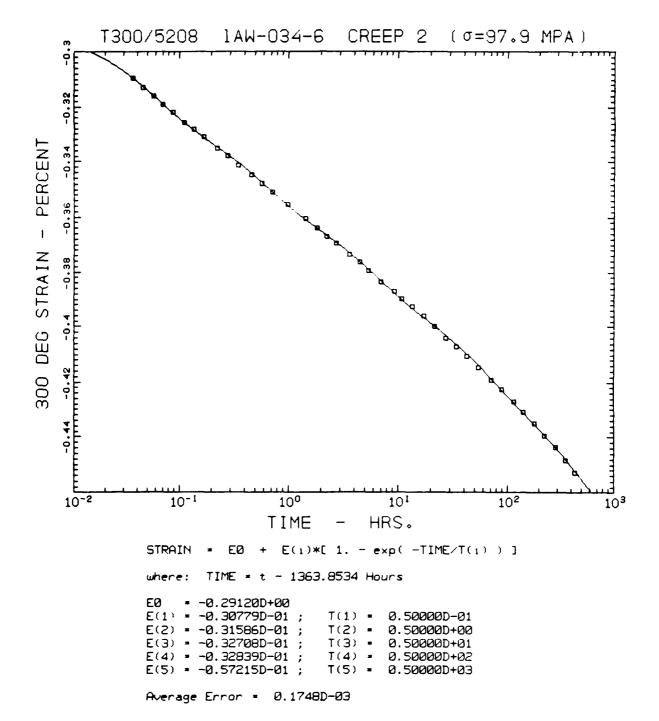


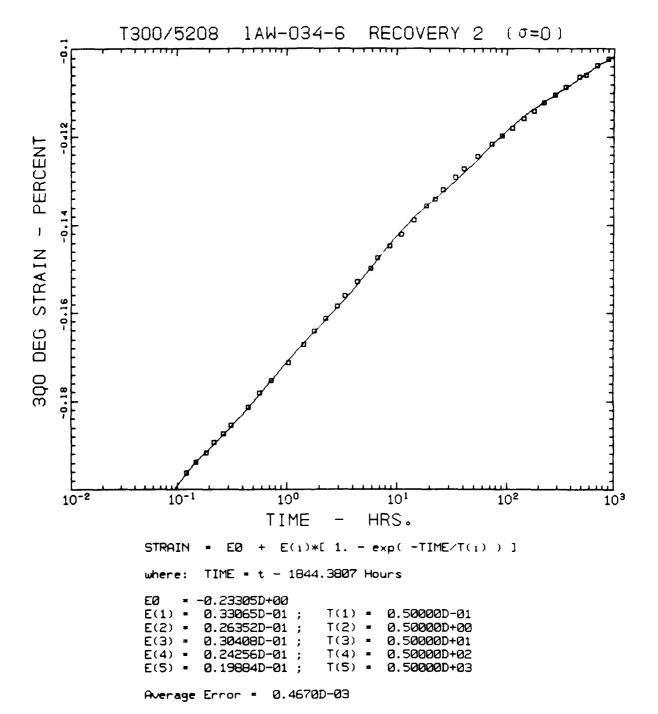


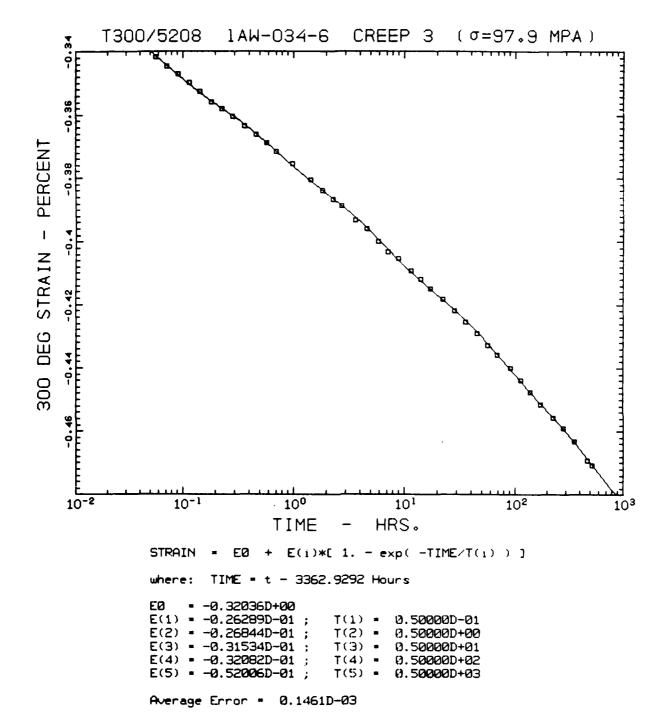
4 . 4





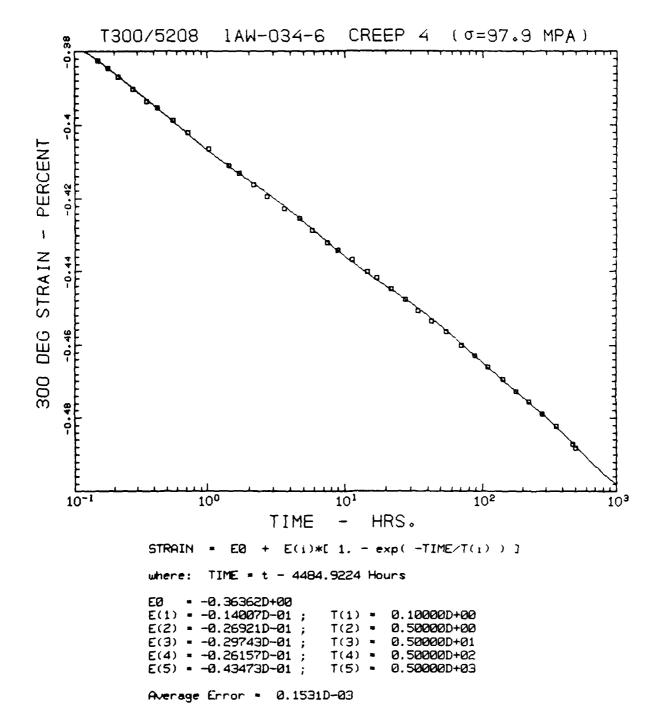


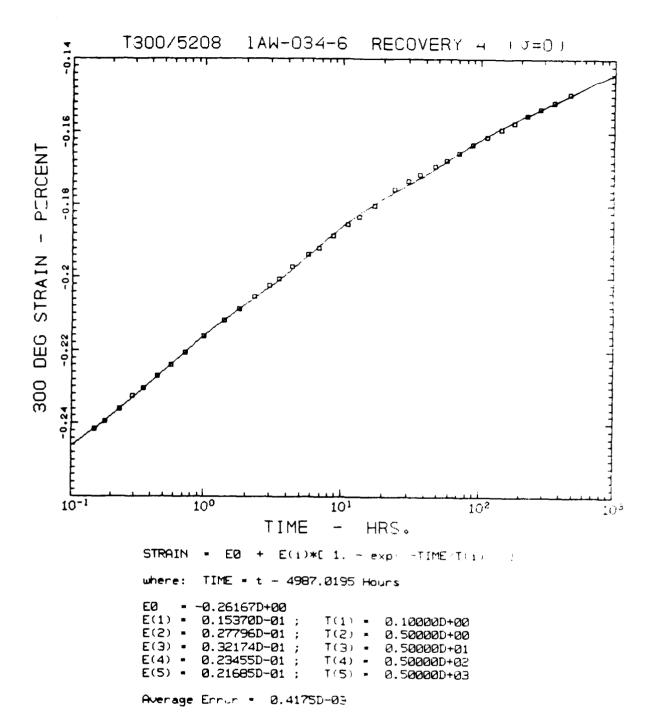




```
RECOVERY 3
               T300/5208
                                     1AW-034-6
                                                                                   (\sigma=0)
STRAIN
300 DEG
                            10°
     10-1
                                                     10<sup>1</sup>
                                                                             10<sup>2</sup>
                                                                                                    10<sup>3</sup>
                                        TIME
                                                   - HRS.
                   STRAIN = E0 + E(i)*[ 1. - exp(-TIME/T(i)) ]
                   where: TIME = t - 3883.3328 Hours
                         - -0.24234D+00
                   E0
                   E(1) = 0.10843D-01;
E(2) = 0.30017D-01;
E(3) = 0.31850D-01;
E(4) = 0.25460D-01;
                                                              0.10000D+00
                                                   T(1) =
                                                   T(2) =
                                                              0.50000D+00
                                                   T(3) =
                                                              0.50000D+01
                   E(4) = 0.25460D-01;

E(5) = 0.22974D-01;
                                                   T(4) = 0.50000D+02
T(5) = 0.50000D+03
                   Average Error = 0.3536D-03
```





```
1AW-034-6
          T300/5208
                                             CREEP 5
                                                             (\sigma = 97.9 \text{ MPA})
PERCENT
300 DEG STRAIN
    10-2
                                                                      10<sup>2</sup>
                                                                                      10<sup>3</sup>
                    10-1
                                     10°
                                                     101
                                   TIME
                                                  HRS.
                                           _
                 STRAIN
                                 + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                         TIME = t - 5468.3433 Hours
                 where:
                      - -0.36354D+00
                 E(1) = -0.35557D-01;
                                            T(1) - 0.50000D-01
                 E(2) = -0.26391D-01;
                                            T(2) -
                                                     0.50000D+00
                 E(3) = -0.29379D-01;
                                            T(3) -
                                                     0.50000D+01
                E(4) = -0.22691D-01;

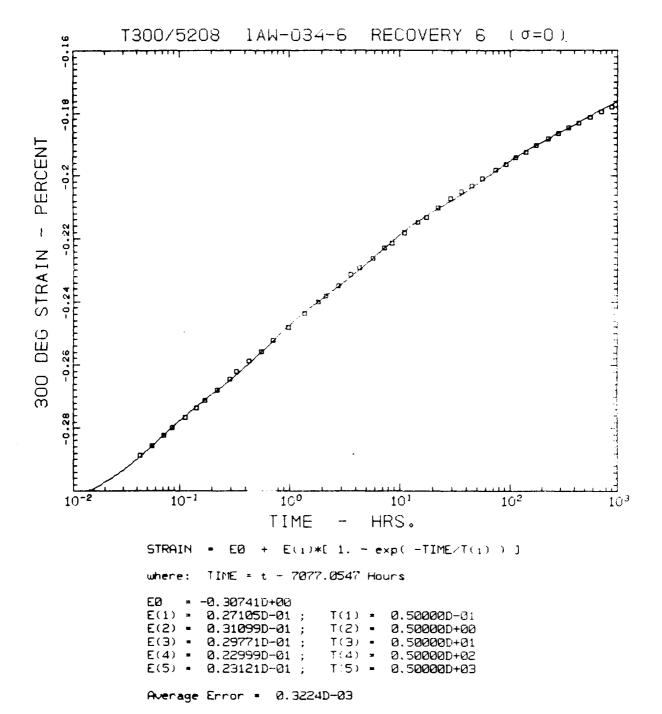
E(5) = -0.39871D-01;
                                                     0.50000D+02
                                            T(4) =
                                            T(5) -
                                                     0.50000D+03
```

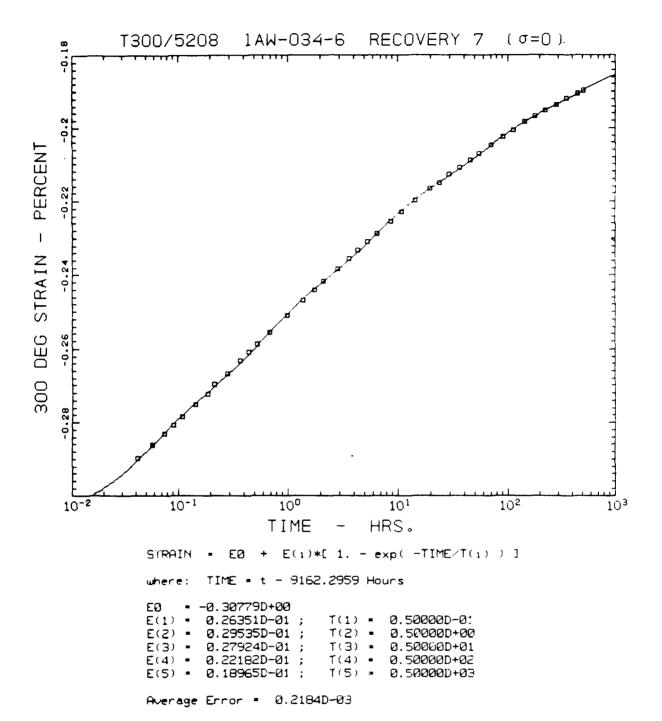
Average Error = 0.2981D-03

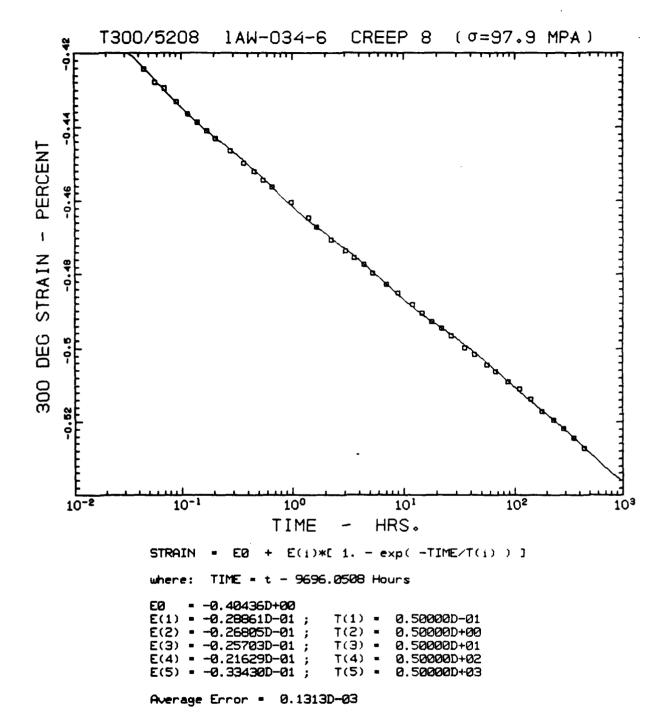
```
T300/5208
                          1AW-034-6
                                          RECOVERY 5 ( \sigma = 0 ).
STRAIN
DEG
300
                  10-1
                                10°
                                              101
    10-2
                                                             10<sup>2</sup>
                                                                           10³
                              TIME
                                           HRS.
                         EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                      TIME = t - 5977.75 Hours
               where:
                    - -0.29269D+00
                      0.27838D-01;
                                              0.50000D-01
                                      T(1) =
                      0.31177D-01;
                                              0.50000D+00
                                      T(2) -
               E(2) =
                                              0.50000D+01
               E(3) =
                      0.30215D-01;
                                      T(3) -
               E(4) =
                      0.23516D-01;
                                      T(4) =
                                              0.50000D+02
               E(5) =
                      0.21897D-01;
                                      T(5) • 0.50000D+03
```

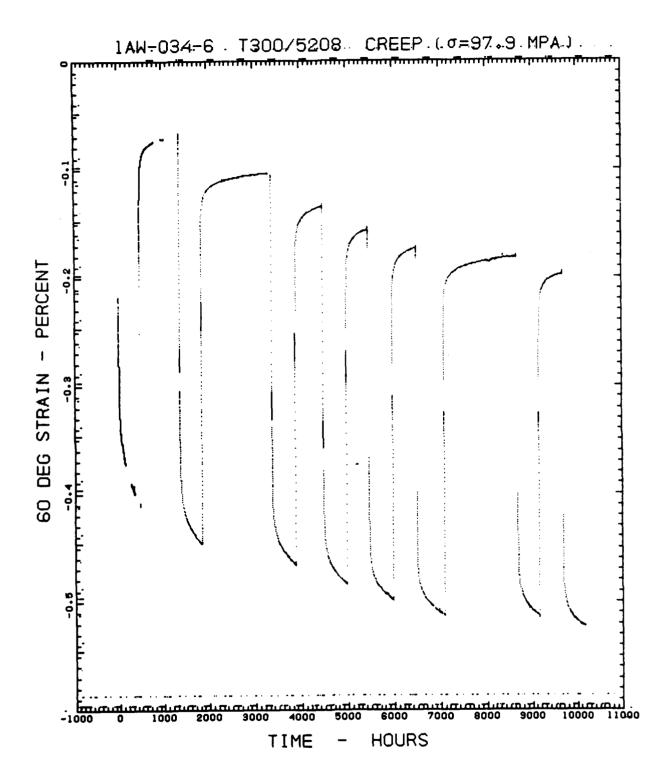
Average Error = 0.2999D-03

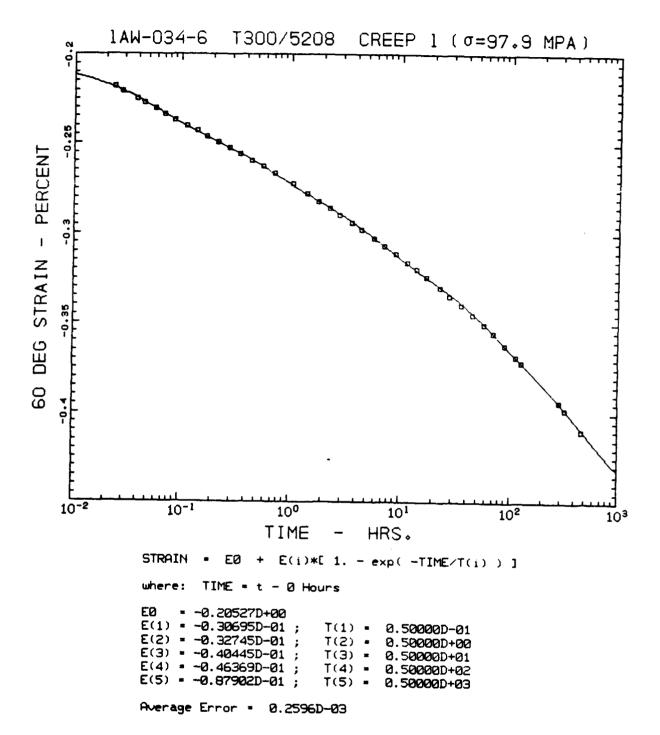
```
T300/5208
                              1AW-034-6
                                                  CREEP 6
                                                                 (\sigma = 97.9 \text{ MPA})
PERCENT
STRAIN
DEG
300
                                                                           10<sup>2</sup>
     10-2
                      10-1
                                       10°
                                                         10<sup>1</sup>
                                                                                            10<sup>3</sup>
                                     TIME
                                                      HRS.
                  STRAIN
                               EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                           TIME = t - 6499.5635 Hours
                  EØ
                       - -0.38221D+00
                  E(1) = -0.30285D-01;
                                                         0.50000D-01
                                               T(1) =
                                               T(2) =
                  E(2) = -0.27425D-01;
                                                         0.50000D+00
                  E(3) = -0.27920D-01;
E(4) = -0.23795D-01;
E(5) = -0.37020D-01;
                                               T(3) =
T(4) =
                                                         0.50000D+01
                                                         0.50000D+02
                                               T(5) =
                                                         0.50000D+03
                  Average Error = 0.1262D-03
```

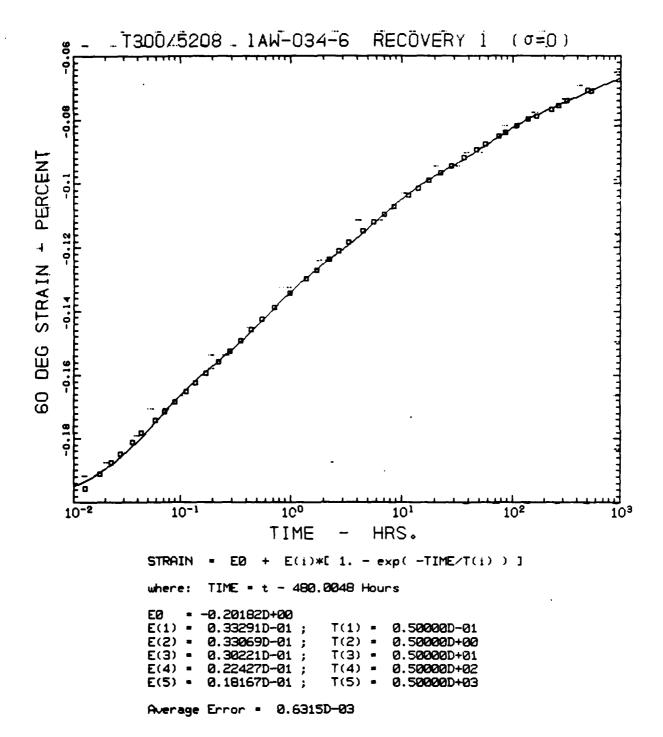




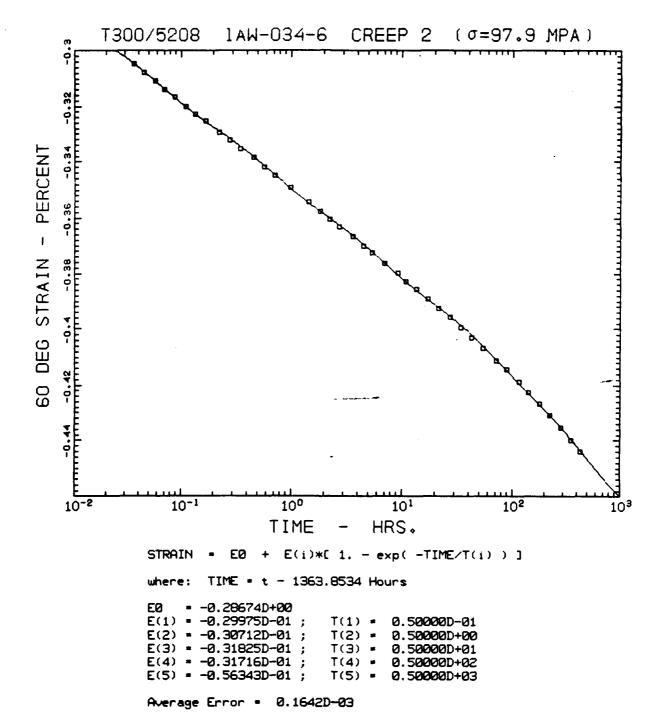


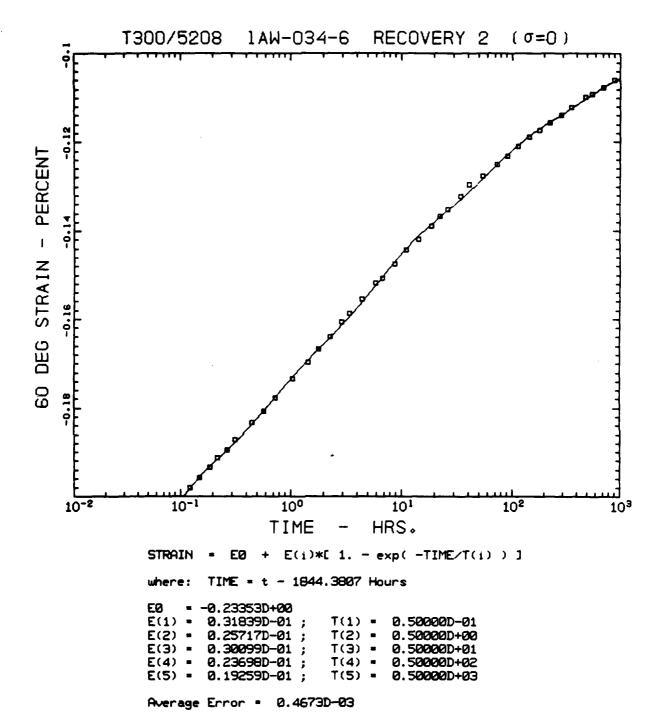






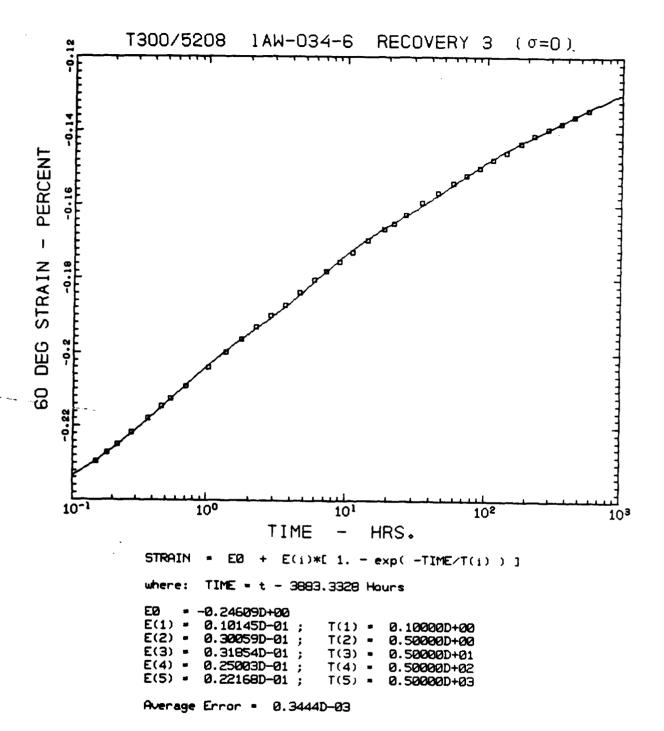
Carleson Paracetes Carlesons caracetes Carlesons Reservoir Land





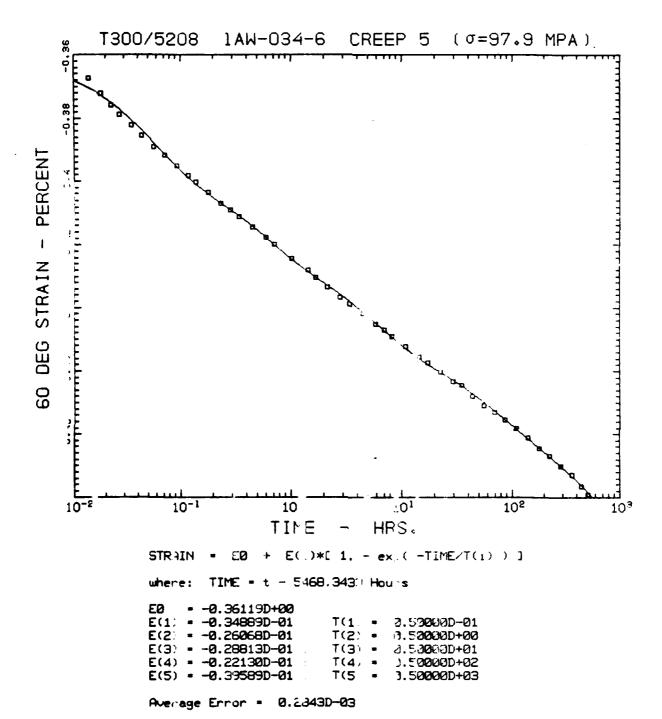
```
T300/5208
                          1AW-034-6
                                             CREEP 3 (\sigma=97.9 MPA)
PERCENT
                                                                                      10<sup>3</sup>
                                     10°
                                                                      10<sup>2</sup>
    10-2
                    10-1
                                                      101
                                   TIME
                                                  HRS.
                 STRAIN
                                 + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                          TIME = t - 3362.9292 Hours
                 where:
                 EØ
                      - -0.31771D+00
                 E(1) = -0.26393D-01;
                                            T(1) =
                                                     0.50000D-01
                                            T(2) =
                 E(2) = -0.26758D-01;
                                                     0.50000D+00
                E(3) = -0.30875D-01;
E(4) = -0.31569D-01;
E(5) = -0.49985D-01;
                                            T(3) =
                                                     0.50000D+01
                                            T(4) =
                                                     0.50000D+02
                                            T(5) =
                                                     0.50000D+03
```

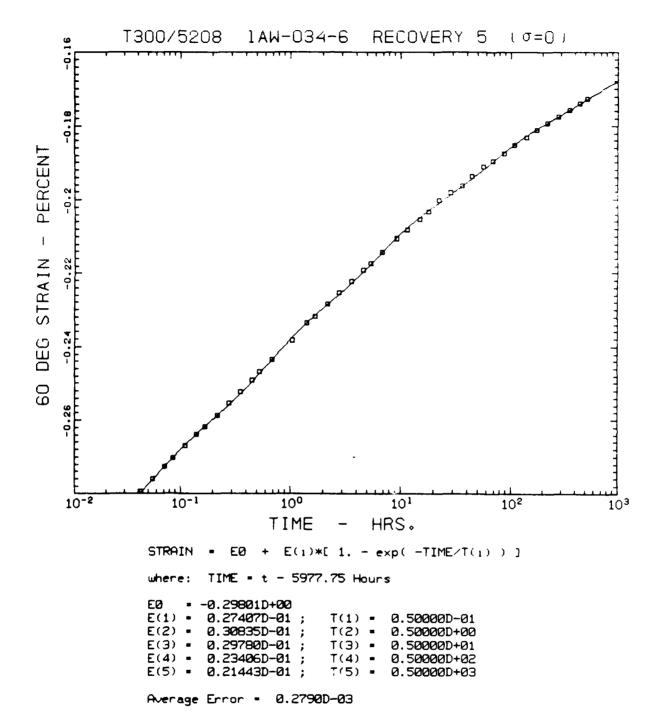
Average Error = 0.1480D-03

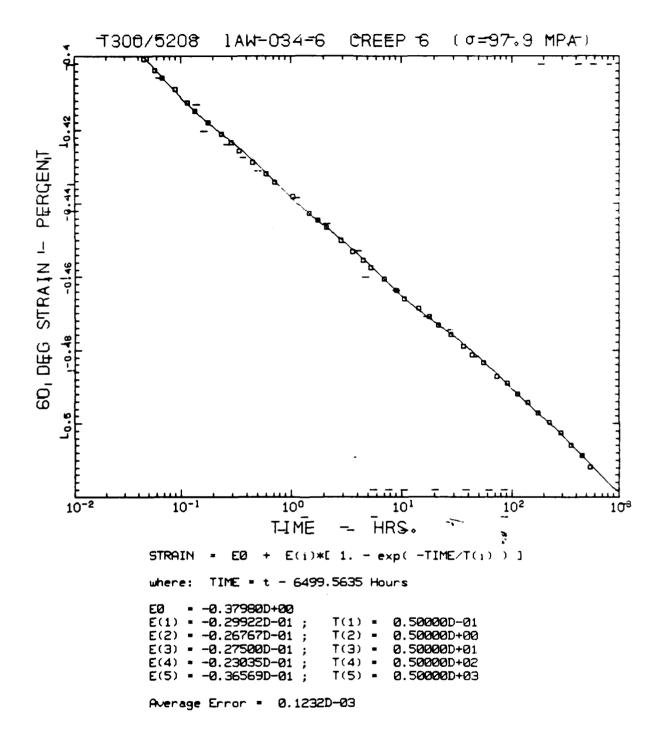


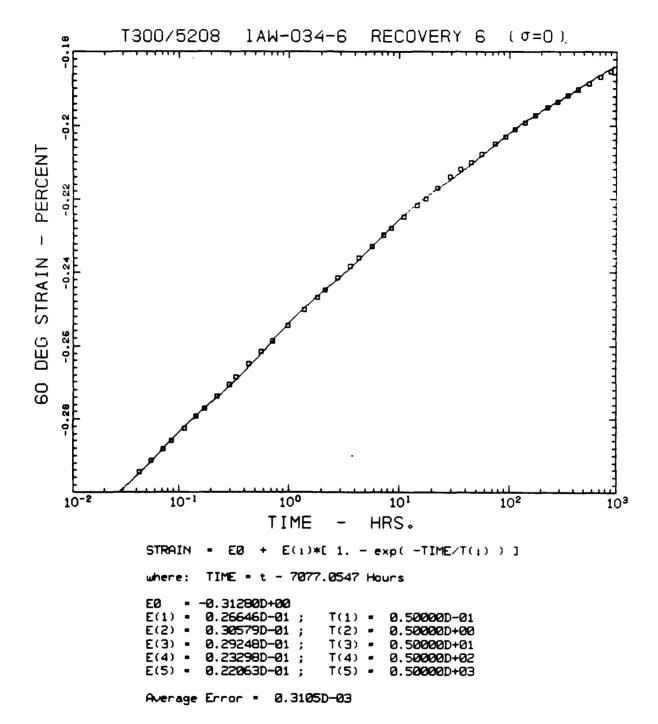
```
T300/5208 1AW-034-6 CREEP 4 (\sigma=97.9 MPA)
    o 42 -0.4 -0.38
PERCENT
STRAIN
נו
נו
0
     1)-1
                            100
                                                   101
                                                                           10<sup>2</sup>
                                                                                                  10<sup>3</sup>
                                        TIME
                                                         HFS.
                                      + E(i)*[ 1. - exi( -TIME/T(i) ) ]
                   STRAIN - EØ
                                            4484.92 24 Hours
                   where:
                             TIME = t
                   E0
                         = -0.35186D+₽0
                   E(1) = -0.12693D-(1);
                                                  T(1) +
                                                             и. 10000D+00
                   E(2) = -0.265590-01;
                                                  T(2) =
                                                             13.50000D+00
                   E(3) = -0.29414D-(1;
E(4) = -0.25495D-01;
E(5) = -0.43333D-(1;
                                                  T(3) =
T(4) =
T(5) =
                                                             3.50000D+01
3.50000D+02
3.50000D+03
                   Average Error = 1.1740D-73
```

```
T300/5208
                               1AW-034-6
                                                   RECOVERY 4
                                                                        (\sigma=0)
DEG STRAIN
9
                         100
    10^{-1}
                                              101
                                                                   10<sup>2</sup>
                                                                                        10<sup>3</sup>
                                              - HRS.
                                   TIME
                                  + E(i)*[ 1. - exp( -TIME/T(1) ) ]
                          TIME = t - 4987.0195 Hours
                       - -0.26623D+00
- 0.14274D-01;
- 0.27906D-01;
                 EØ
                 E(1) =
                                             T(1) =
                                                      0.10000D+00
                                             T(2) =
                 E(2) =
                                                      0.50000D+00
                          0.31907D-01
0.23429D-01
                 E(3) =
                                             T(3) =
                                                      Ø.50000D+01
                 E(4) =
                                             T(4) =
                                                      0.50000D+02
                 E(5) =
                          0.21464D-01;
                                             T(5) •
                                                      0.50000D+03
                 Average Error = 0.3862D-03
```









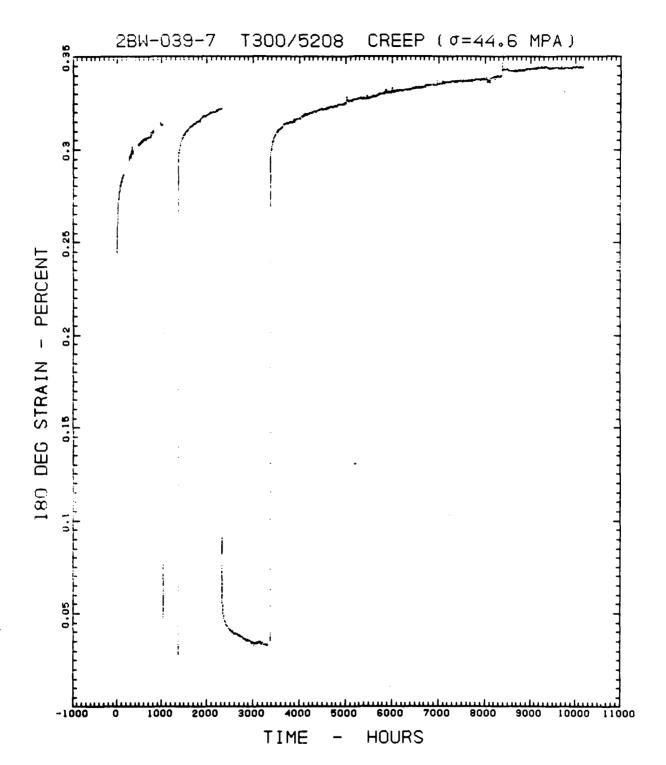
```
T300/5208
                                 1AW-034-6
                                                   RECOVERY 7 (σ=0)
PERCENT
DEG STRAIN
9
                     10-1
                                                                         10<sup>2</sup>
     10-2
                                       10°
                                                        10<sup>1</sup>
                                                                                          10<sup>3</sup>
                                     TIME
                                                     HRS.
                  STRAIN
                              EØ + E(1)*[ 1. - exp(-TIME/T(1)) ]
                           TIME = t - 9162.2959 Hours
                        - -0.31259D+00
                           0.24857D-01;
                                                        0.50000D-01
                  E(1) =
                                               T(1) =
                           0.29230D-01;
                  E(2) =
                                              T(2) •
                                                        0.50000D+00
                           0.27252D-01;
0.22534D-01;
0.18073D-01;
                  E(3) =
                                               T(3) =
                                                        0.50000D+01
                  E(4) =
E(5) =
                                               T(4) =
                                                        0.50000D+02
0.50000D+03
                                               T(5) =
```

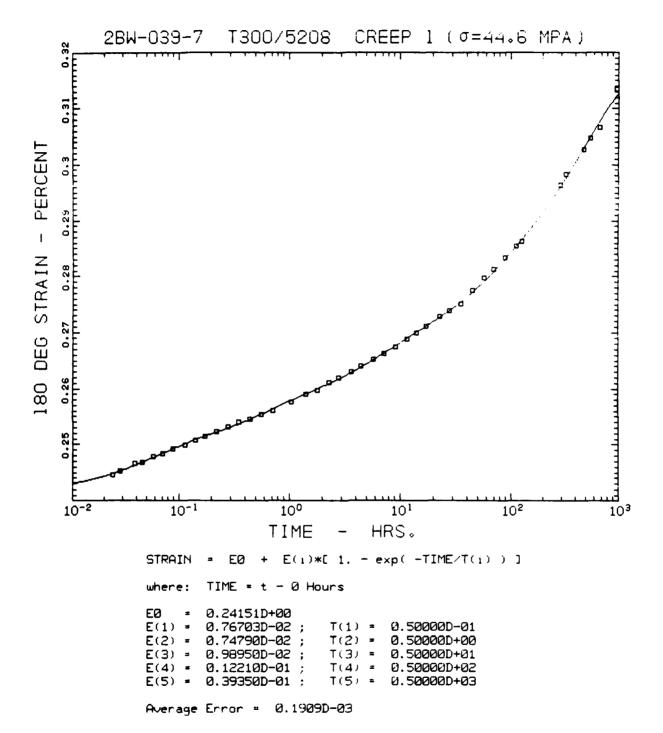
Average Error = 0.2191D-03

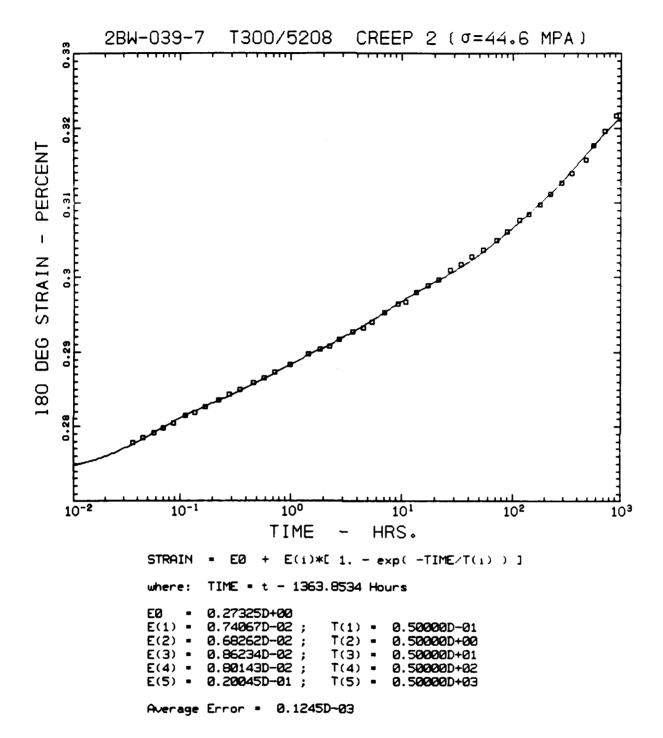
```
T300/5208
                           1AW-034-6
                                              CREEP 8
                                                            (\sigma=97.9 \text{ MPA})
PERCENT
DEG STRAIN
9
                                                    101
    10-2
                    10-1
                                    10°
                                                                     10<sup>2</sup>
                                                                                     10<sup>3</sup>
                                  TIME
                                                  HRS.
                           E0 + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                where: TIME = t - 9696.0500 Hours
                      - -0.40275D+00
                EØ
                E(1) = -0.27886D-01;
                                                    0.50000D-01
                                            T(1) =
                E(2) = -0.26354D-01;
                                            T(2) -
                                                    0.50000D+00
                E(3) = -0.25034D-01;

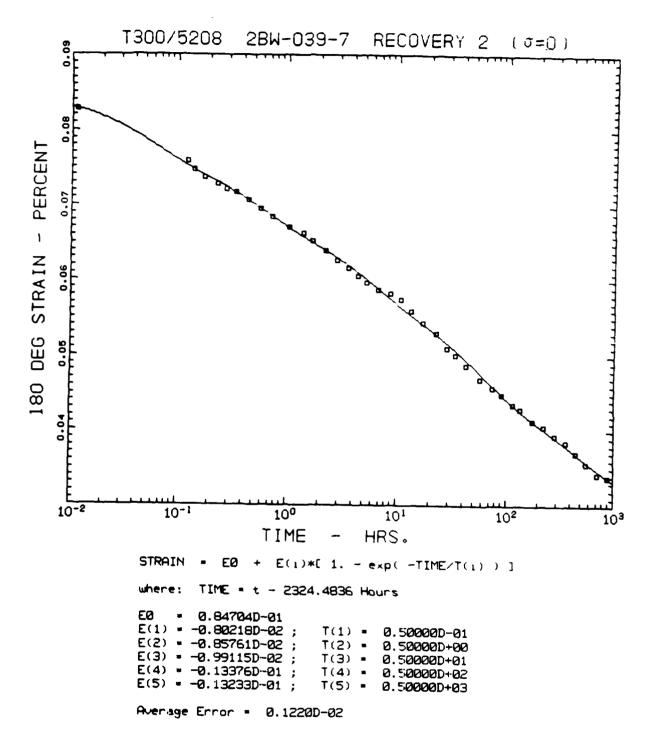
E(4) = -0.21145D-01;
                                            T(3) =
                                                    0.50000D+01
                                            T(4) =
                                                    0.50000D+02
                E(5) = -0.32102D-01;
                                            T(5) =
                                                    0.50000D+03
```

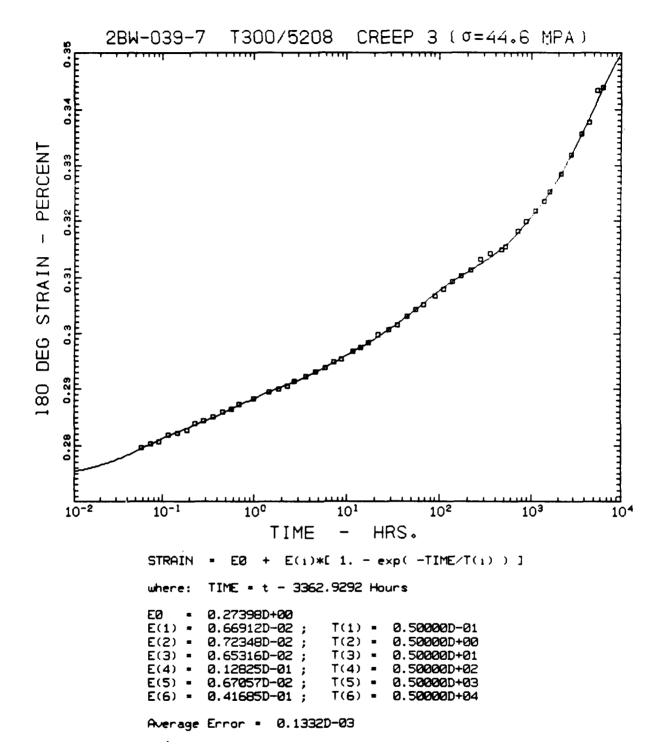
Average Error = 0.1185D-03

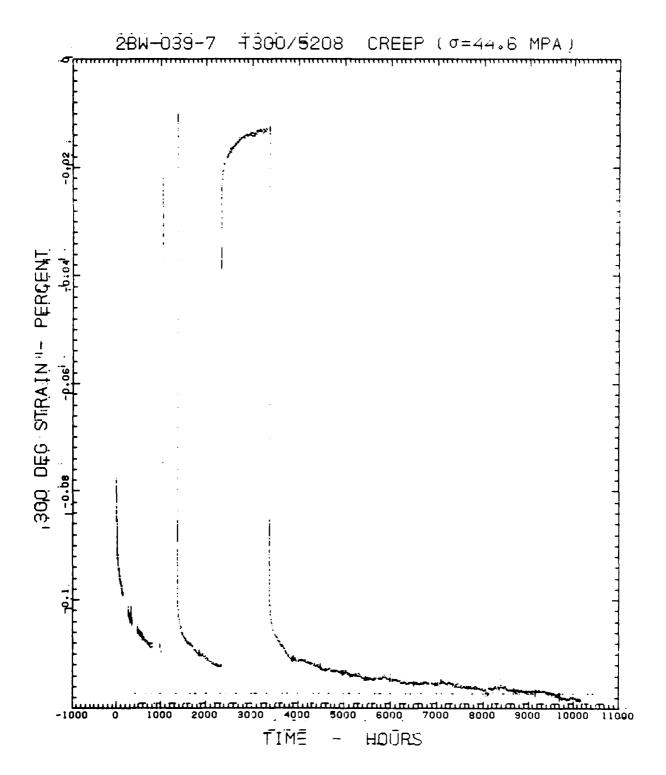


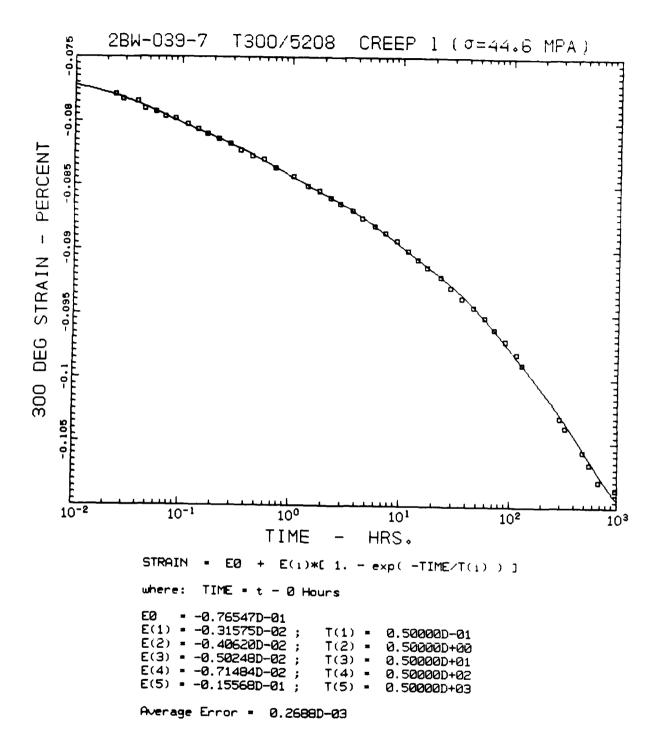


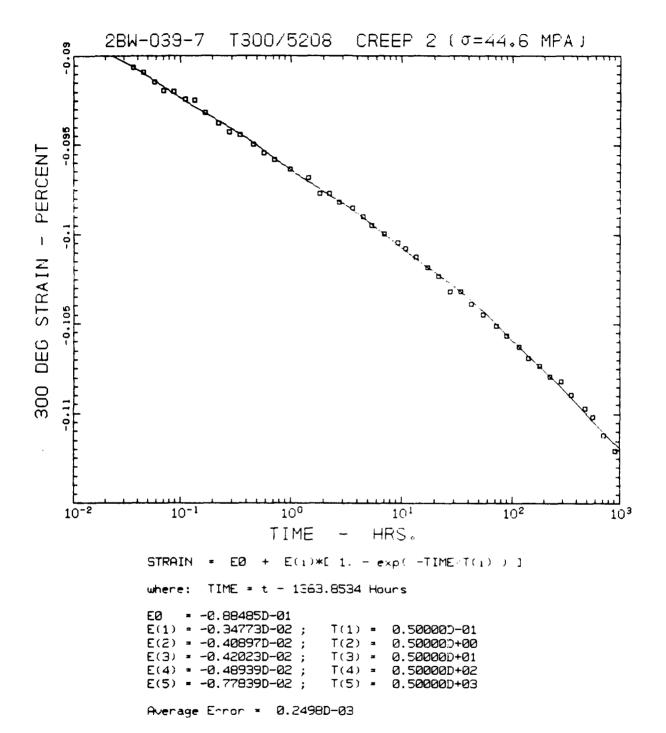


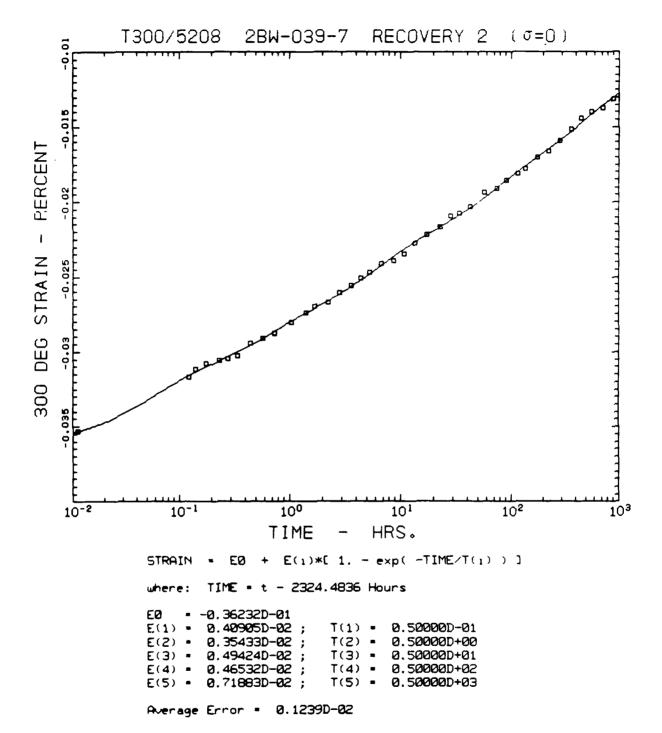






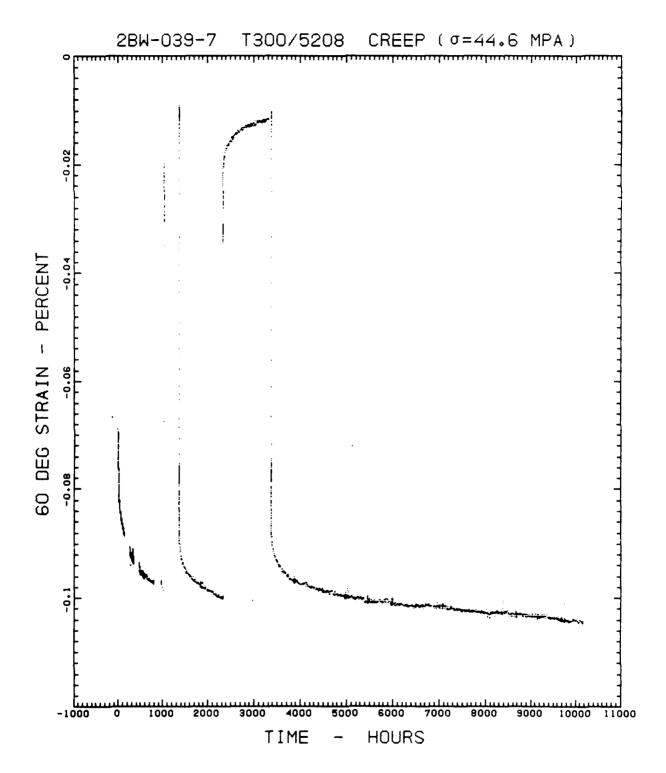


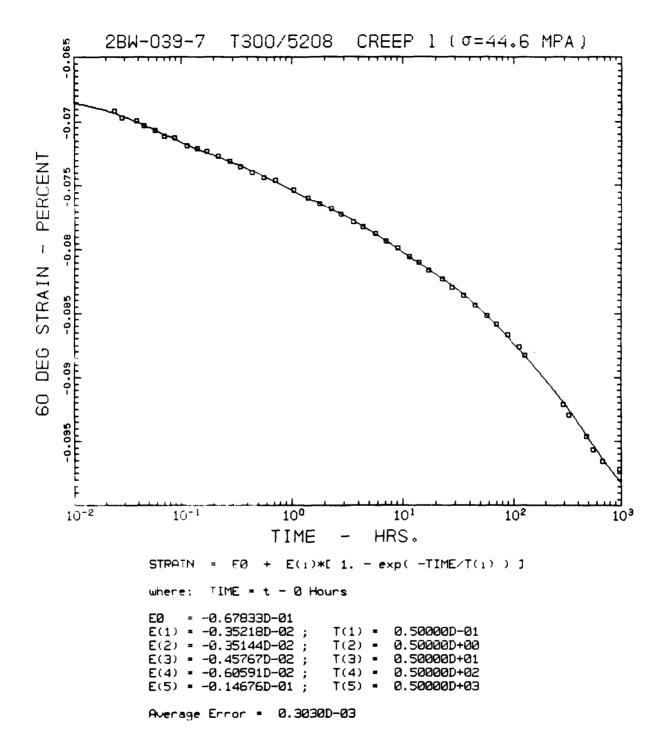


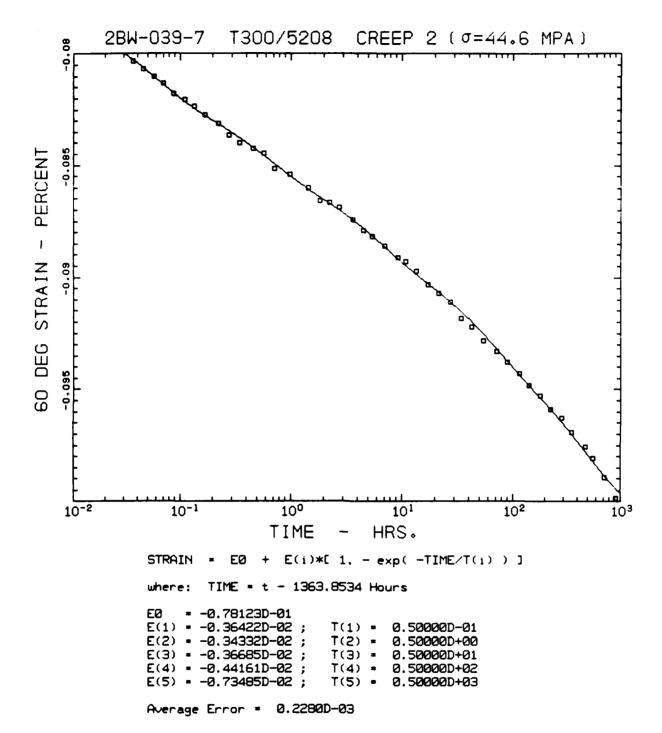


```
2BW-039-7 T300/5208 CREEP 3 (σ=44.6 MPA)
PERCENT
STRAIN
DEG
    10-2
                                          101
                10-1
                             10<sup>0</sup>
                                                      10<sup>2</sup>
                                                                   10<sup>3</sup>
                                                                                104
                                TIME
                                              HRS.
               STRAIN
                          EØ + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                        TIME = t - 3362.9292 Hours
               where:
                     = -0.87645D-01
               E(1) = -0.38666D-02;
                                         T(1) =
                                                 0.50000D-01
               E(2) = -0.37631D-02;
                                         T(2) =
                                                 0.50000D+00
               E(3) = -0.39367D-02;
                                         T(3) =
                                                 0.50000D+01
                                         T(4) =
               E(4) = -0.62273D - 02;
                                                 0.50000D+02
               E(5) = -0.62291D-02;
                                         T(5) =
                                                 0.50000D+03
               E(6) = -0.77329D-02;
                                         T(6, =
                                                 0.50000D+04
```

Average Error = 0.2914D-03

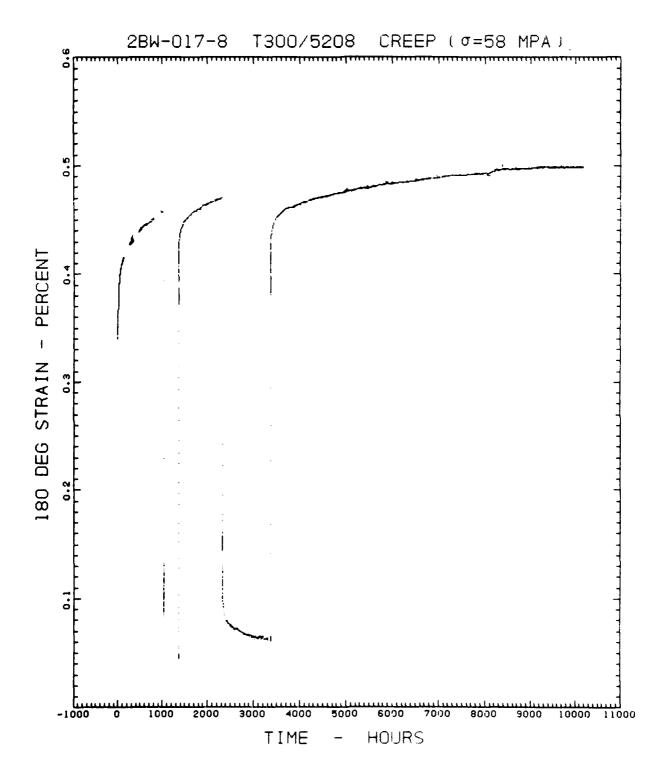


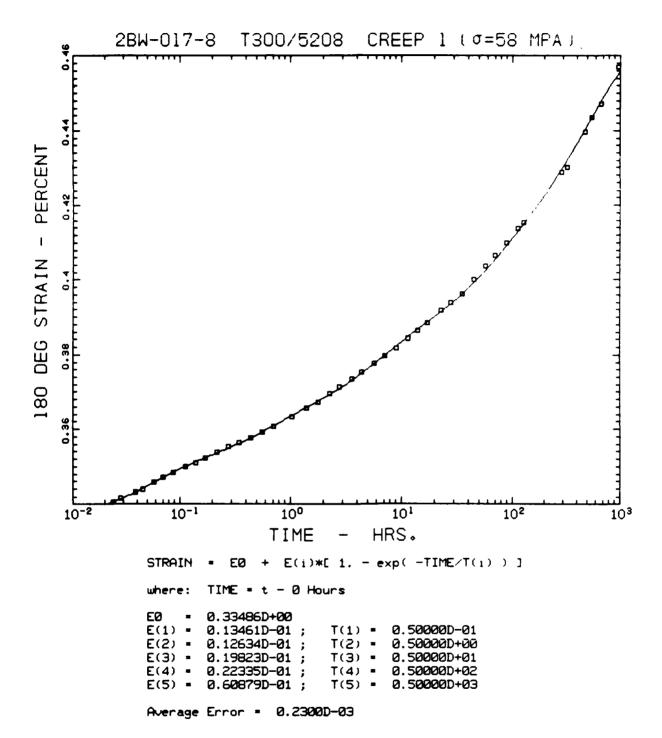


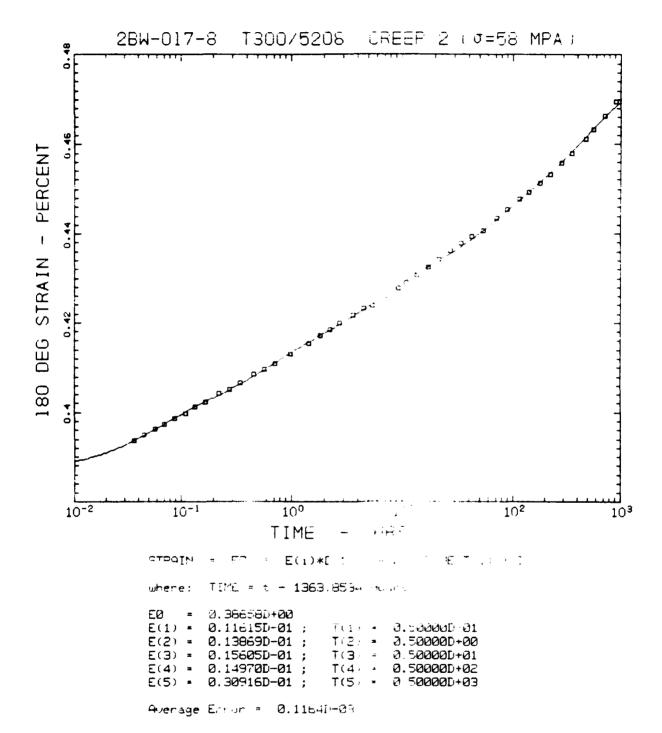


```
T300/5208 2BW-039-7 RECOVERY 2 (\sigma=0)
DEG STRAIN
60
    10-2
                                 100
                                                               10<sup>2</sup>
                  10^{-1}
                                                                              10<sup>3</sup>
                                                10<sup>1</sup>
                               TIME
                                             HRS.
               STRAIN = EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                       TIME = t - 2324.4836 Hours
               EØ
                    - -0.31994D-01
                       0.35005D-02;
                                                0.50000D-01
               E(1) =
                                        T(1) =
                                                0.50000D+00
               E(2) =
                       0.29020D-02;
                                        T(2) =
                       0.41995D-02;
                                        T(3) *
                                                0.50000D+01
               E(3) =
                       0.42893D-02;
               E(4) =
                                        T(4) =
                                                0.50000D+02
                                        T(5) =
               E(5) = 0.64318D-02;
                                                0.50000D+03
               Average Error = 0.1282D-02
```

```
2BW-039-7
                            T300/5208
                                              CREEP 3 ( \sigma = 44.6 \text{ MPA} )
PERCENT
STRAIN
DEG
60
    10-2
                 10-1
                              10°
                                           10<sup>1</sup>
                                                        10<sup>2</sup>
                                                                     10<sup>3</sup>
                                                                                  104
                                           - HRS.
                                 TIME
                STRAIN
                           EØ + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                        TIME * t - 3362.9292 Hours
                EØ
                     - -0.76847D-01
                E(1) = -0.34691D-02;
                                          T(1) =
                                                   0.50000D-01
                E(2) = -0.29945D-02;
                                          T(2) =
                                                   0.50000D+00
                E(3) = -0.38320D-02;
                                          T(3) =
                                                   0.50000D+01
                E(4) = -0.52494D-02;
                                          T(4) =
                                                   0.50000D+02
               E(5) = -0.51858D - 02;
                                          T(5) =
                                                   0.50000D+03
                E(6) = -0.83748D-02;
                                          T(6) =
                                                   0.50000D+04
                Average Error * 0.2456D-03
```



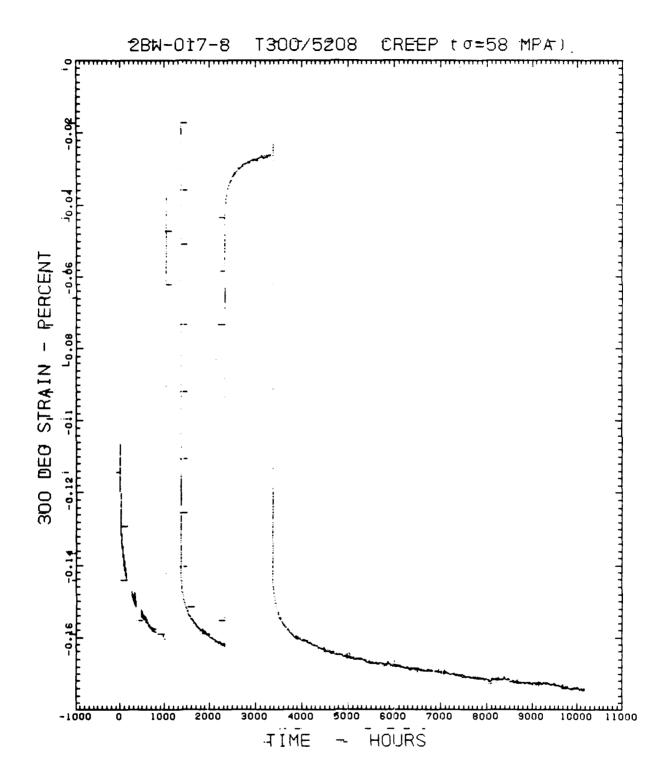


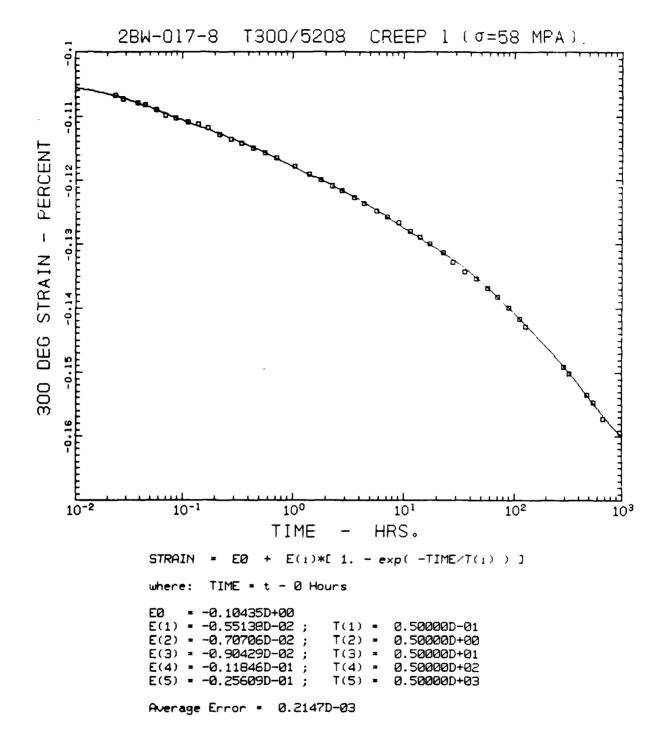


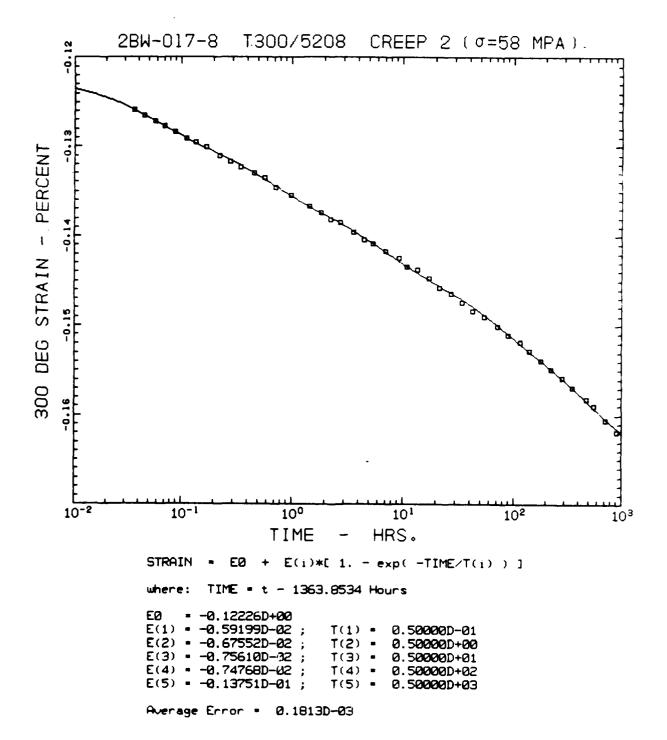
```
T300/5208
                            2BW-017-8
                                              RECOVERY 2 (σ=0)
- PERCENT
DEG STRAIN
180
                                  10°
                                                  10<sup>1</sup>
                                                                 10<sup>2</sup>
    10-2
                   10-1
                                                                                 10<sup>3</sup>
                                               HRS.
                                 TIME
                STRAIN
                           EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                        TIME = t - 2324.4836 Hours
                EØ
                        0.14899D+00
                E(1) = -0.16067D-01;
                                         T(1) =
                                                  0.50000D-01
                E(2) = -0.14091D-01;
                                         T(2) =
                                                  0.50000D+00
                E(3) = -0.17296D-01;
                                         T(3) =
                                                  0.50000D+01
                E(4) = -0.20871D-01;
                                         T(4) =
                                                  0.50000D+02
                                         T(5) =
                                                  0.50000D+03
                E(5) = -0.20735D-01:
```

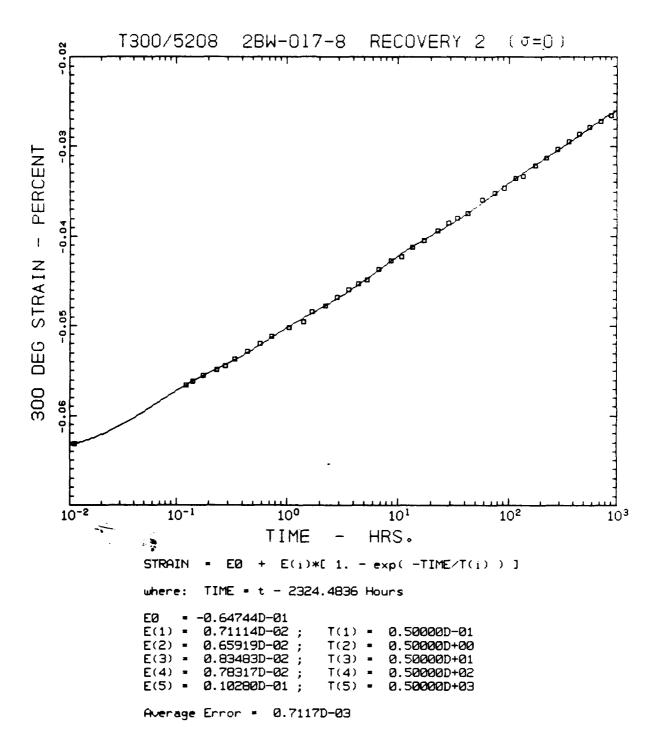
Average Error = 0.1012D-02

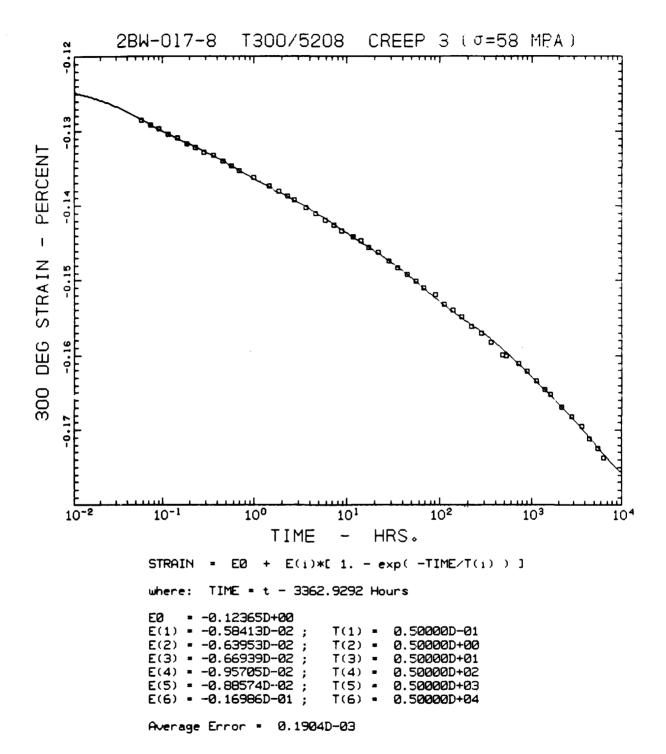
```
2BW-017-8
                              T300/5208
                                                 CREEP 3 ( \sigma=58 MPA )
DEG STRAIN - PERCENT
180
                                            10<sup>1</sup>
                               10°
                                                          10<sup>2</sup>
                                                                        10<sup>3</sup>
    10-2
                 10-1
                                                                                     104
                                  TIME
                                                  HRS.
                             EØ + E(1)*[ 1. - exp(-TIME/T(1)) ]
                STRAIN
                          TIME = t - 3362.9292 Hours
                 where:
                          0.39336D+00
                EØ
                         0.10070D-01;
                                                     0.50000D-01
                                            T(1) =
                                            T(2) =
                         0.13122D-01;
                                                     0.50000D+00
                                            T(3) =
                         0.12981D-01;
                                                     0.50000D+01
                         0.19559D-01;
                                            T(4) =
                                                     0.50000D+02
                         0.13753D-01;
0.50584D-01;
                E(5) =
                                            T(5) =
                                                     0.50000D+03
                                            T(6) =
                                                     0.50000D+04
                Average Error = 0.1238D-03
```

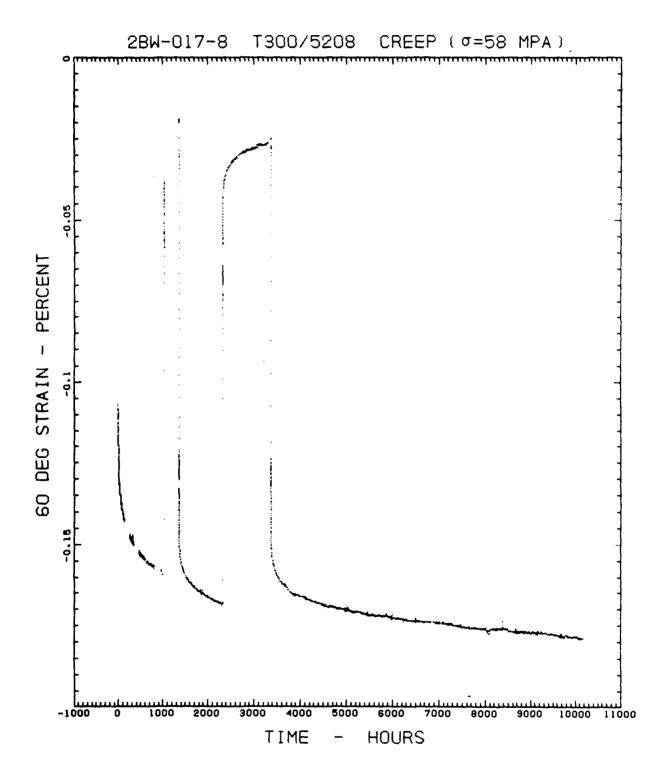


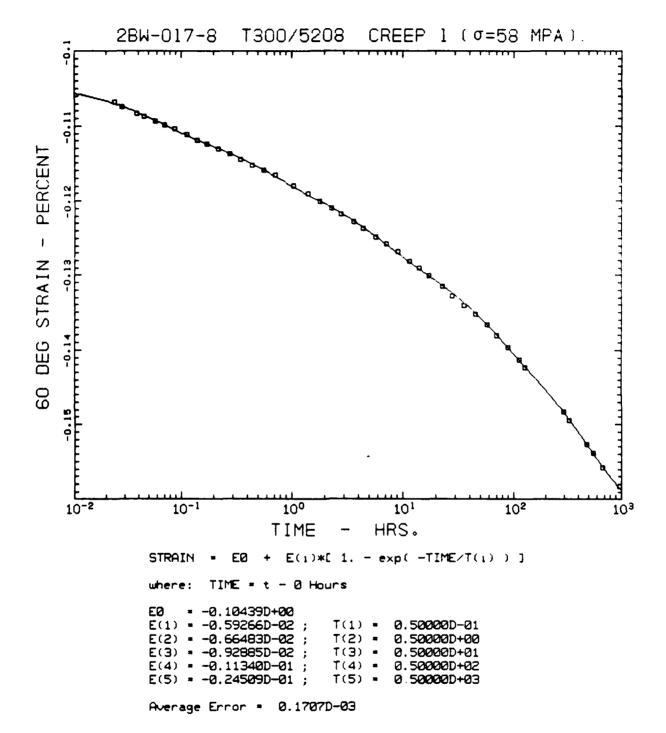


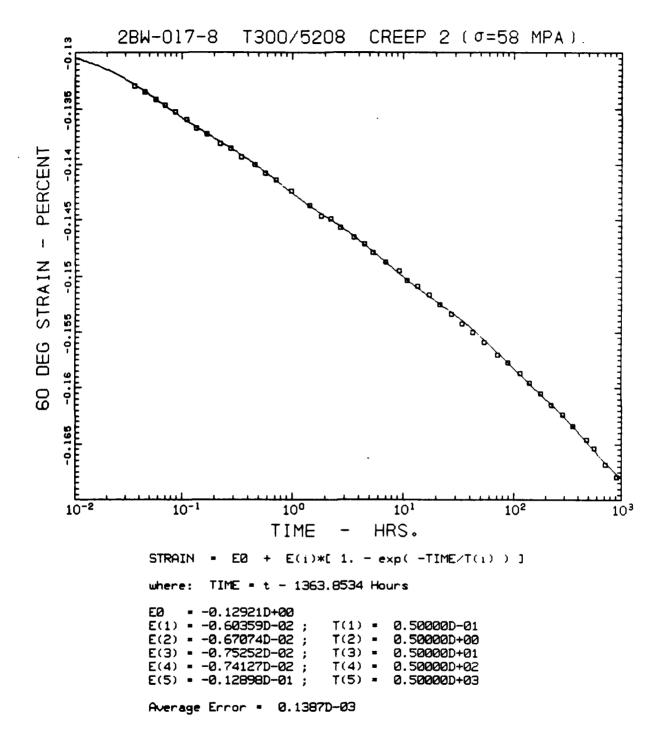


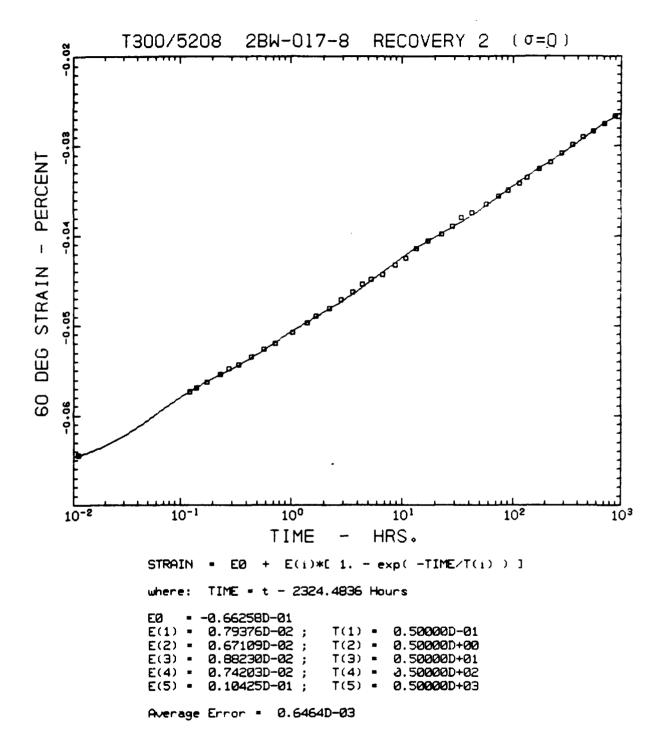


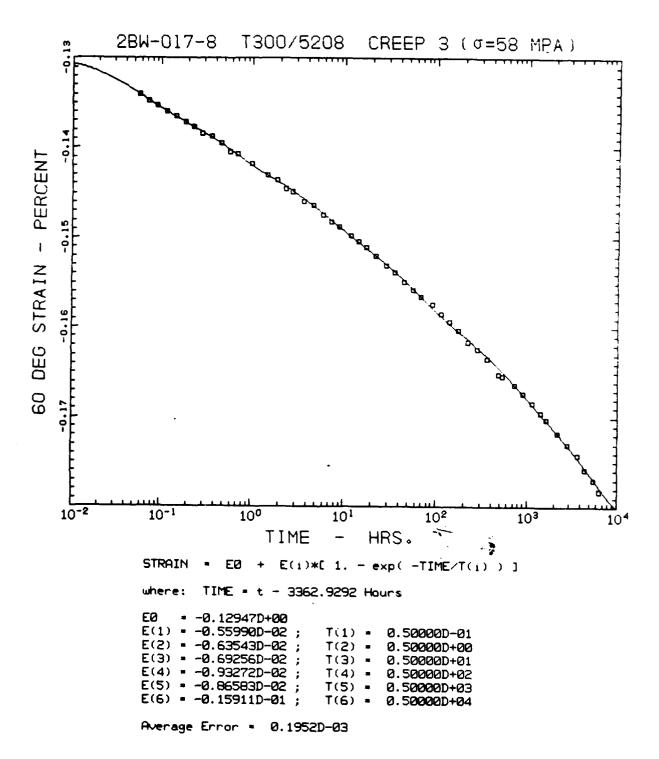


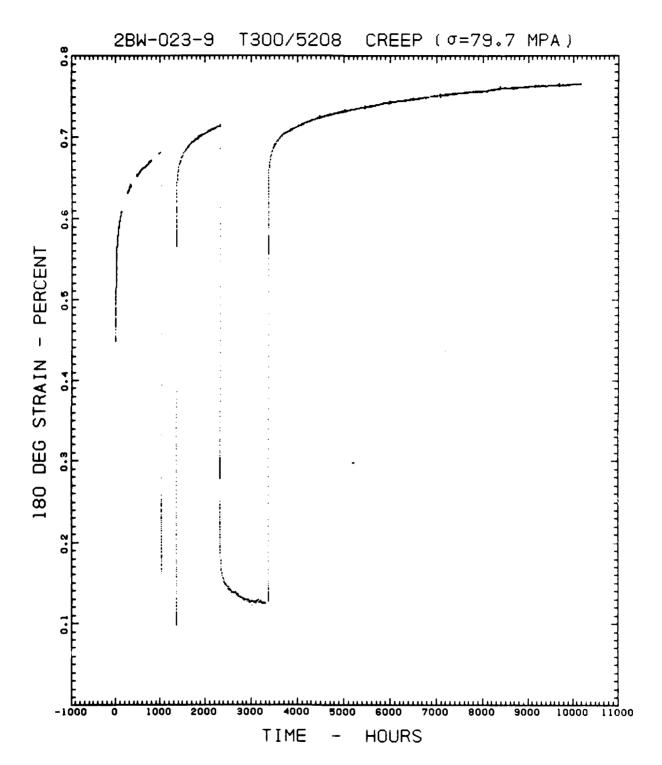




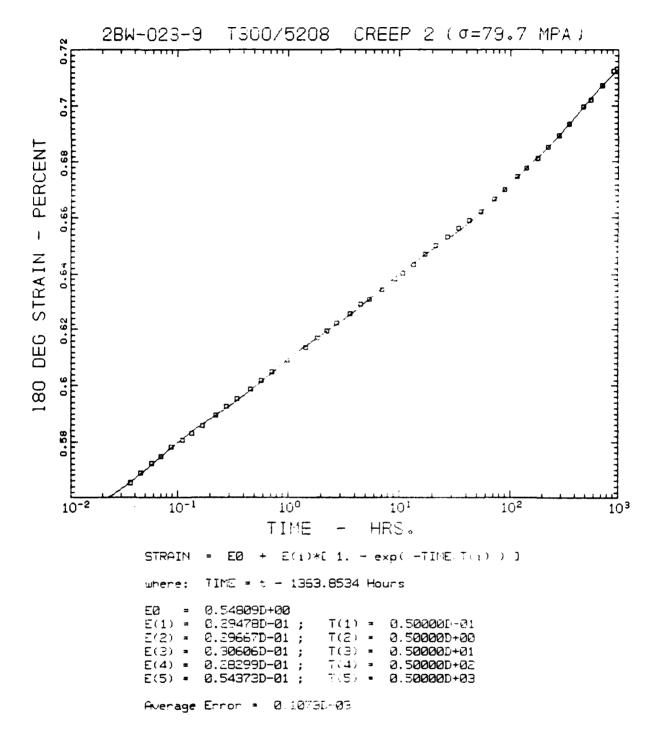


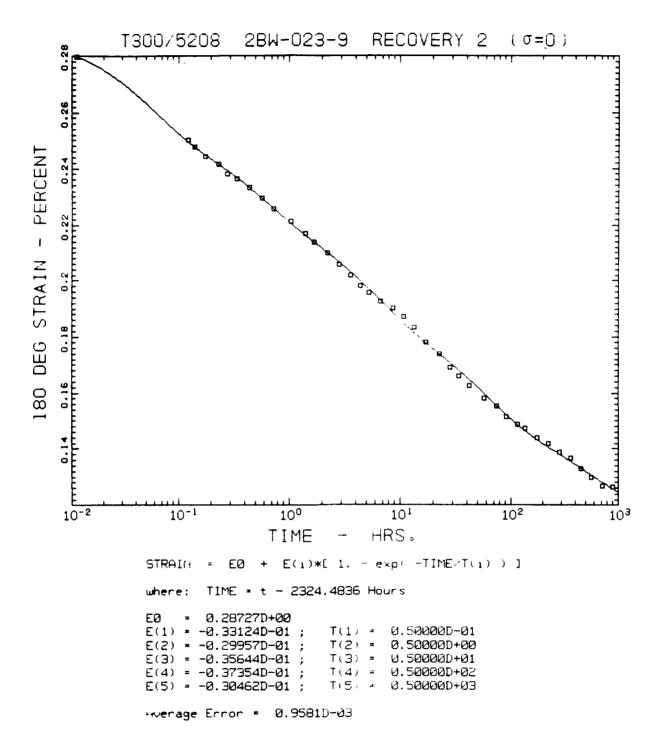


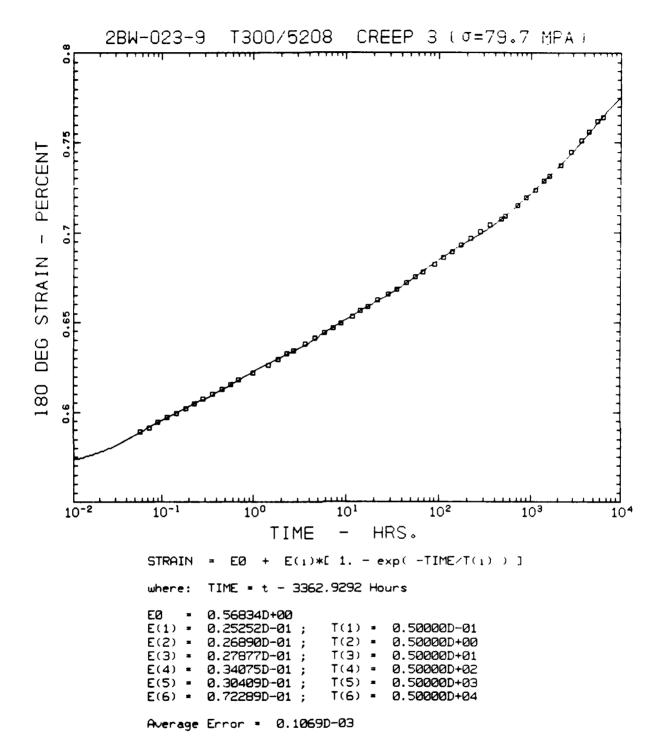


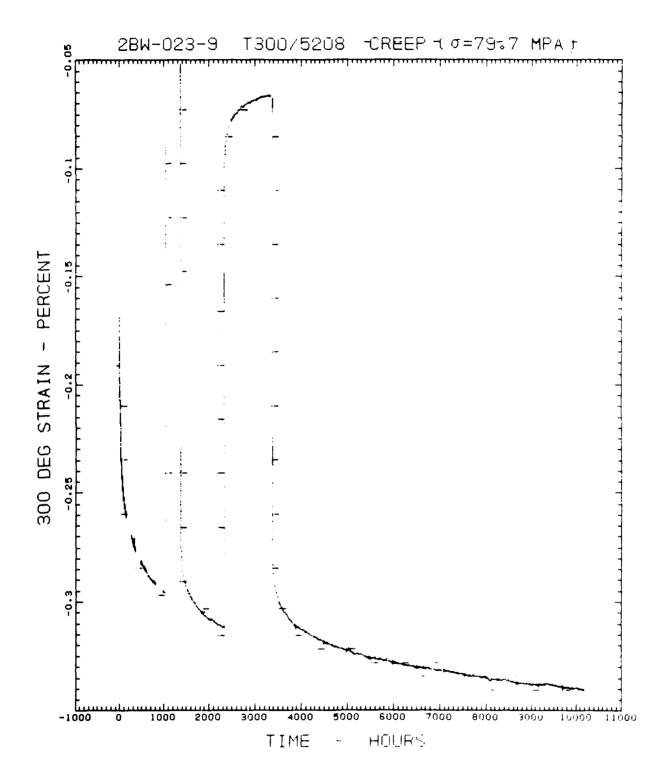


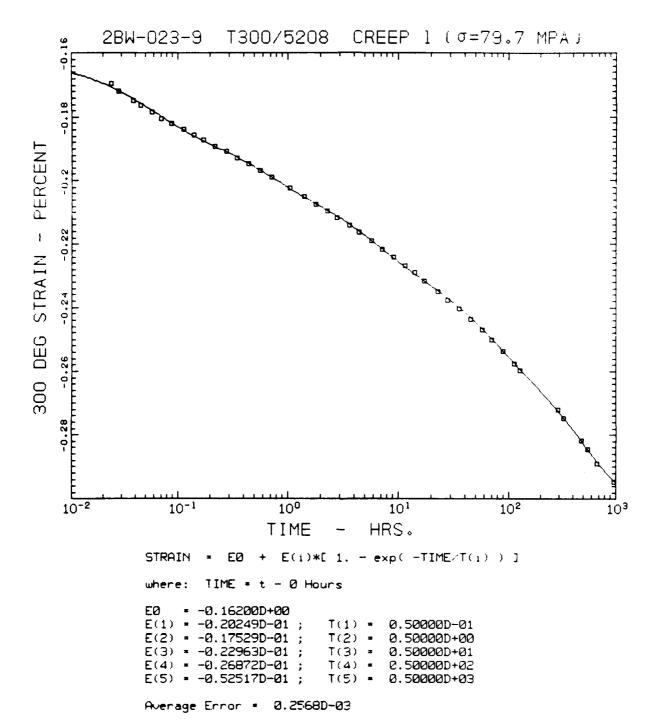
```
2BW-023-9
                                T300/5208
                                                     CREEP 1 (\sigma=79.7 MPA)
PERCENT
180 DEG STRAIN
                      10-1
     10-2
                                         10°
                                                           10<sup>1</sup>
                                                                             10<sup>2</sup>
                                                                                               10<sup>3</sup>
                                      TIME
                                                       HRS.
                                     + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                            TIME = t - 0 Hours
                  EØ
                            0.43388D+00
                   E(1) =
                            0.38381D-01;
                                                           0.50000D-01
                                                 T(1) =
                            0.28376D-01;
                                                 T(2) =
                                                           0.50000D+00
                            0.42734D-01;
0.44873D-01;
0.10420D+00;
                                                          0.50000D+01
0.50000D+02
0.50000D+03
                                                 T(3) =
                                                 T(4) =
                                                 T(5) =
                  Average Error = 0.2053D-03
```

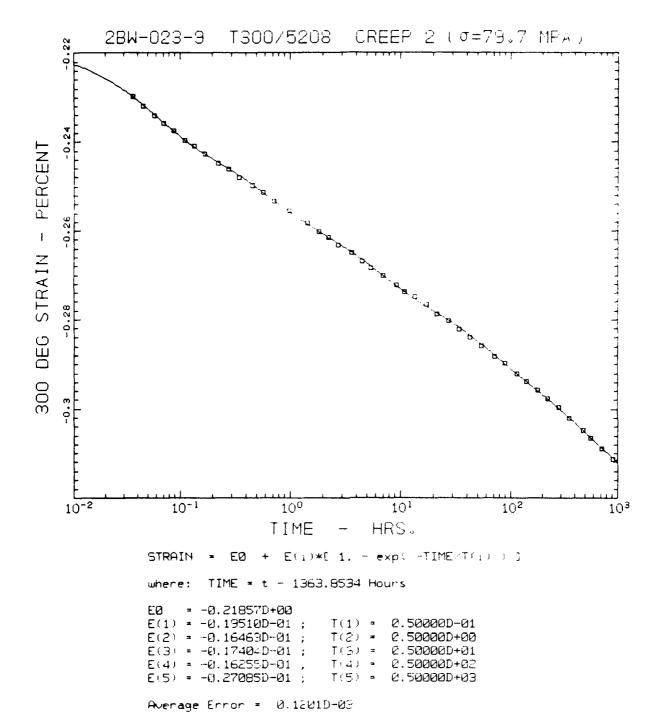


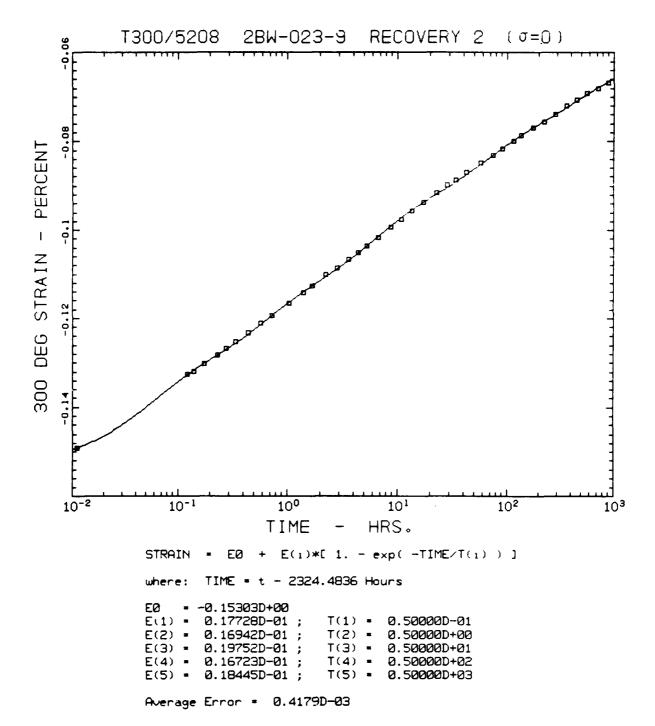






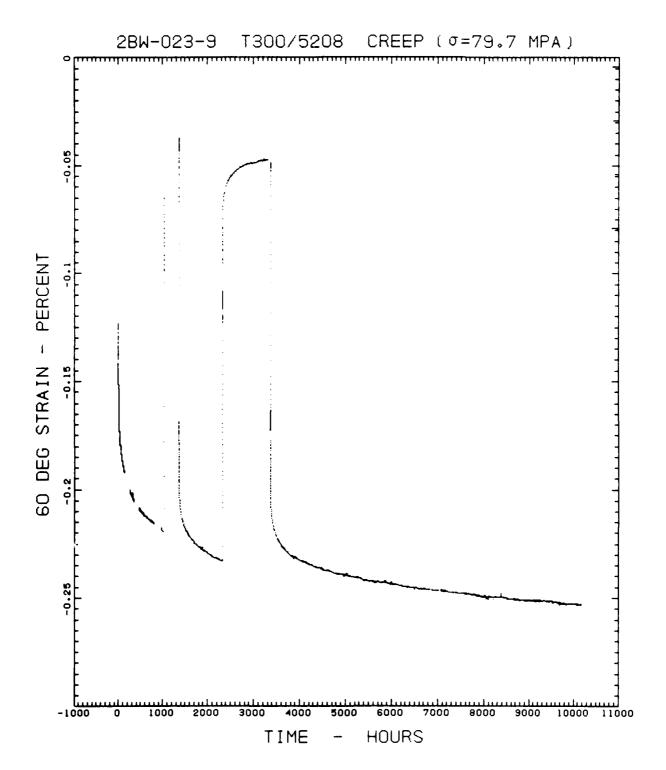


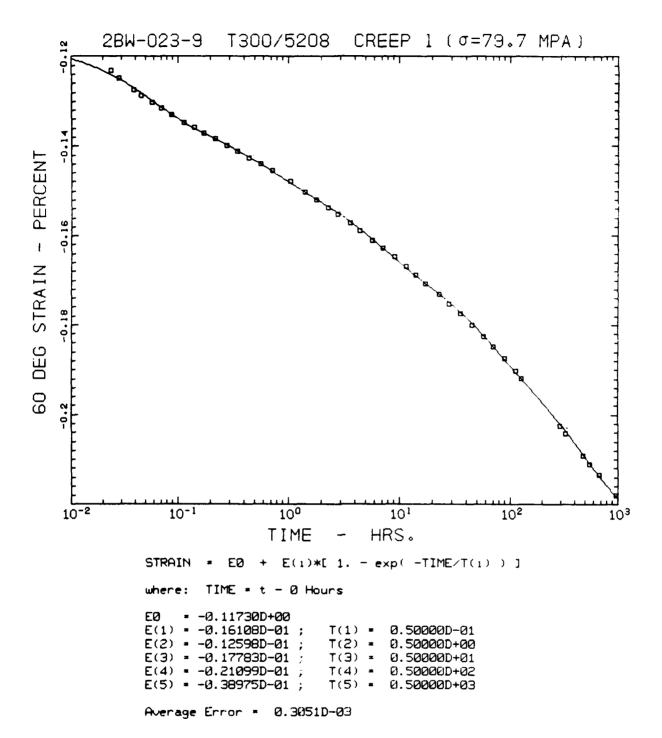


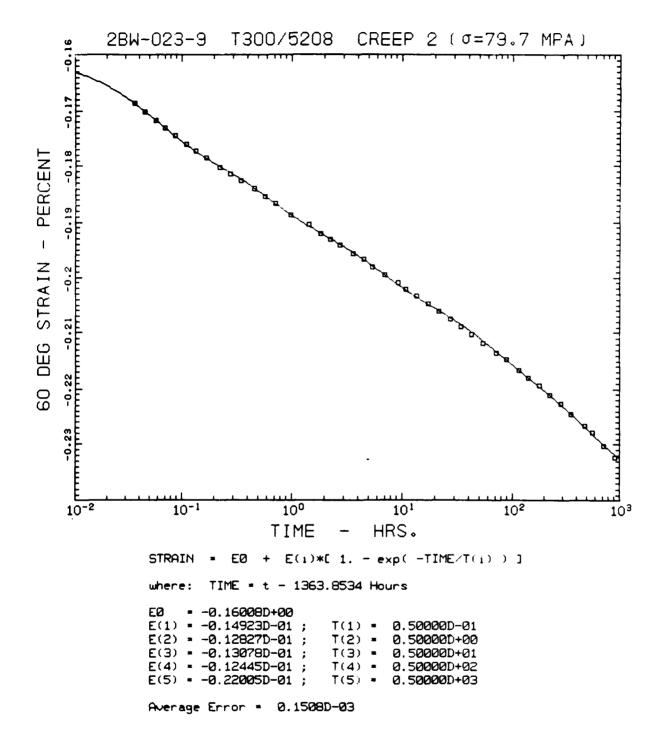


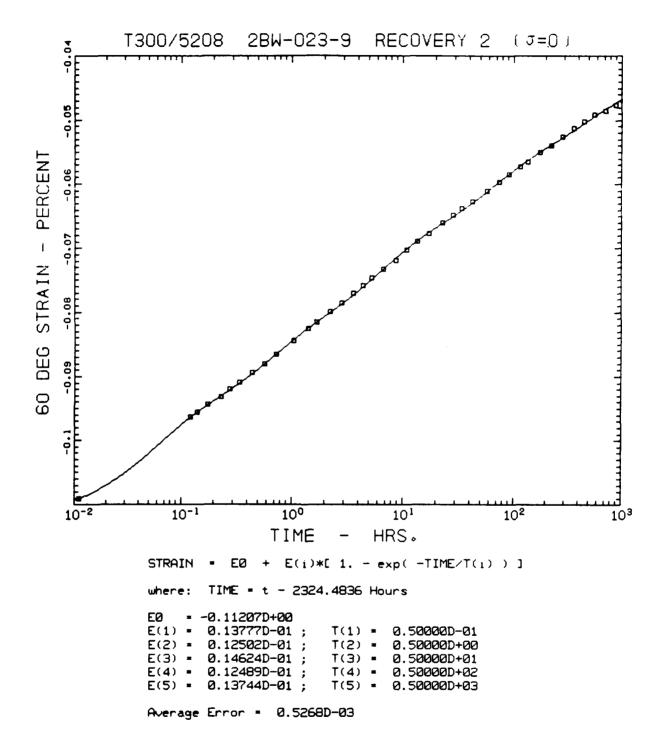
```
2BW-023-9
                           T300/5208 CREEP 3 (\sigma=79.7 MPA)
DEG STRAIN - PERCENT
300
                                                                      10<sup>3</sup>
    10-2
                 10^{-1}
                              10°
                                           10<sup>1</sup>
                                                         10<sup>2</sup>
                                                                                   104
                                  TIME
                                                HRS.
                                           _
                STRAIN
                            E\emptyset + E(i)*[1. - exp(-TIME/T(i))]
                where:
                         TIME = t - 3362.9292 Hours
                      - -0.23054D+00
                E(1) = -0.14658D-01;
                                          T(1) =
                                                   0.50000D-01
                E(2) = -0.14789D-01;
                                                   0.50000D+00
                                          T(2) =
                E(3) = -0.16583D-01;
                                                   0.50000D+01
                                          T(3) =
                E(4) = -0.18652D - 01;
                                          T(4) =
                                                   0.50000D+02
                E(5) = -0.18552D-01;
                                          T(5) =
                                                   0.50000D+03
                E(6) = -0.35052D-01;
                                          T(6) =
                                                   0.50000D+04
```

Average Error = 0.1452D-03



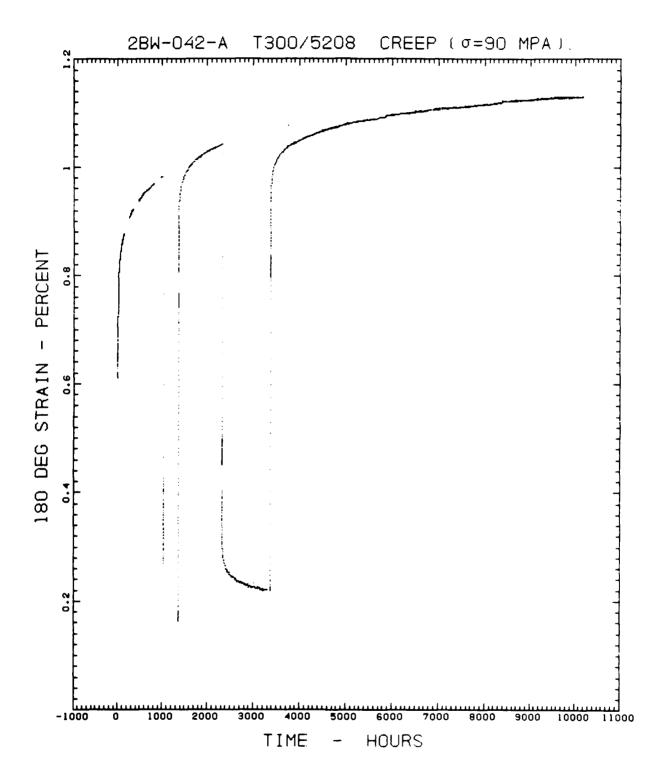


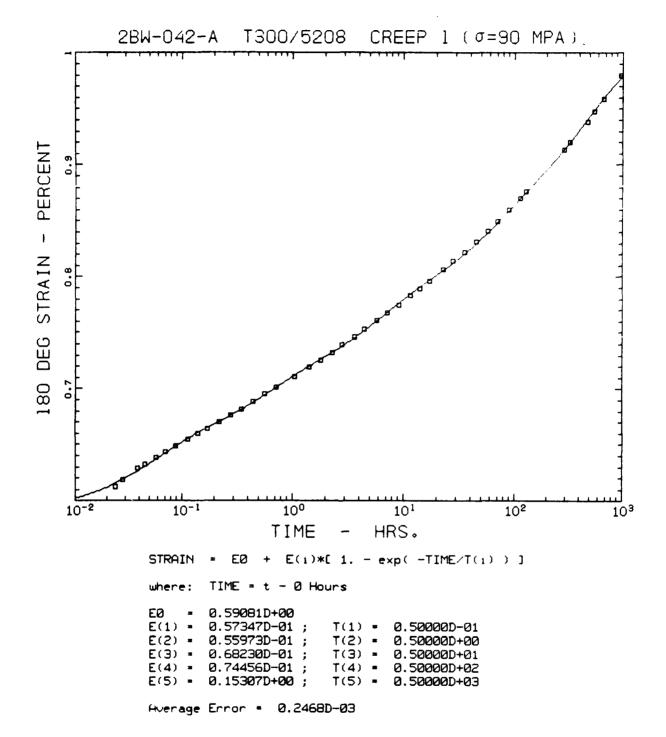


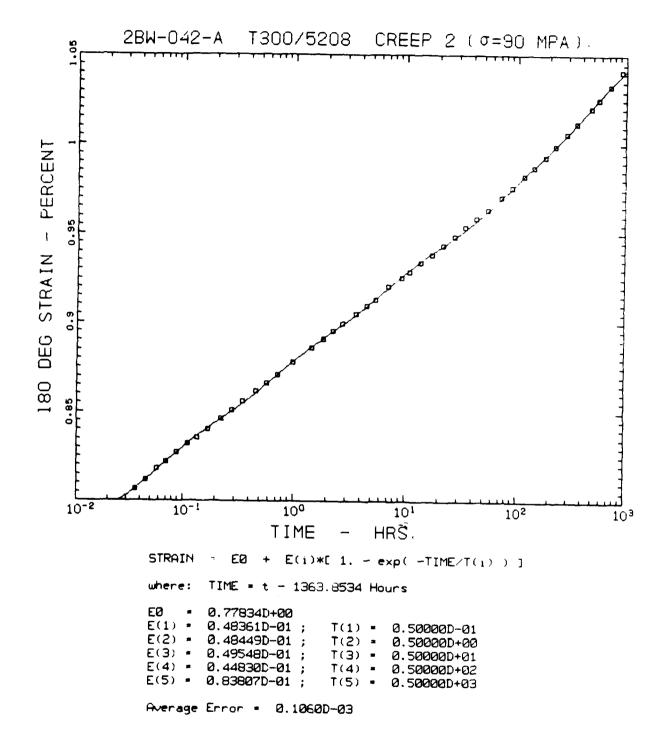


```
2BW-023-9 T300/5208 CREEP 3 (\sigma=79.7 MPA)
- PERCENT
DEG STRAIN
60
    10-2
                                          101
                                                       10<sup>2</sup>
                10^{-1}
                             100
                                                                     10<sup>3</sup>
                                                                                 104
                                               HRS.
                                 TIME
                                         _
                           EØ + E(i)*[1. - exp(-TIME/T(i))]
                STRAIN
                        TIME = t - 3362.9292 Hours
                where:
                     - -0.16728D+00
                EØ
                E(1) = -0.11885D-01;
                                          T(1) = 0.50000D-01
                E(2) = -0.11938D-01;
                                          T(2) =
                                                  0.50000D+00
                E(3) = -0.12444D-01;
                                          T(3) =
                                                  0.50000D+01
                E(4) = -0.15245D-01;
                                          T(4) =
                                                  0.50000D+02
               E(5) = -0.14039D-01;

E(6) = -0.26693D-01;
                                          T(5) =
                                                  0.50000D+03
                                          T(6) = 0.50000D+04
               Average Error = 0.1882D-03
```







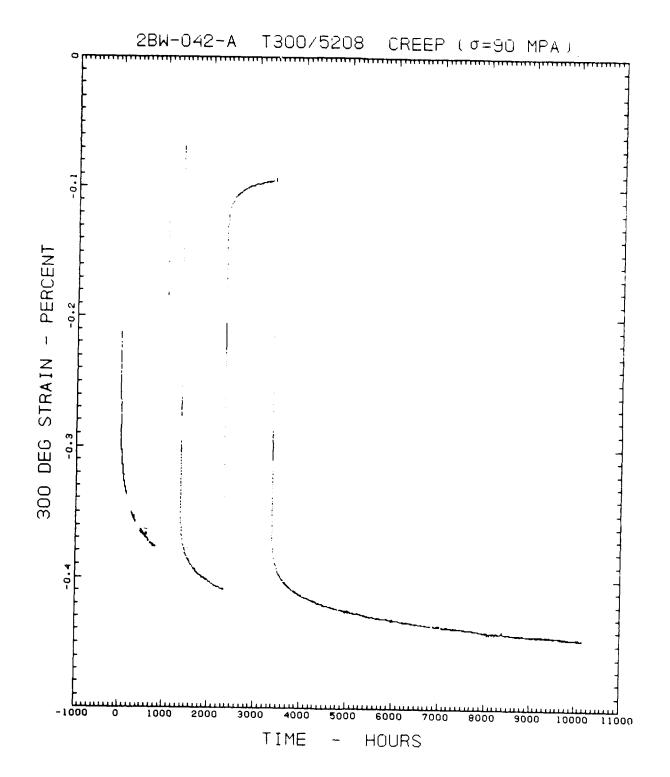
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```
2BW-042-A RECOVERY 2 ( \sigma = 0 )
            T300/5208
PERCENT
STRAIN
DEG
   :
180
                                 10°
    10-2
                  10^{-1}
                                                10<sup>1</sup>
                                                               102
                                                                              10<sup>3</sup>
                                TIME
                                             HRS.
               STRAIN
                         EØ + E(i)*[ 1. - exp(-TIME/T(i)) ]
                       TIME = t - 2324.4836 Hours
               where:
                    = 0.46354D+00
               E(1) = -0.49837D-01;
                                        T(1) = 0.50000D-01
                                        T(2) = 0.50000D+00
               E(2) = -0.51553D-01;
               E(3) = -0.57097D-01;
                                        T(3) -
                                               0.50000D+01
               E(4) = -0.43237D-01;
                                        T(4) =
                                               0.50000D+02
               E(5) = -0.48317D-01;
                                        T(5) = 0.50000D+03
```

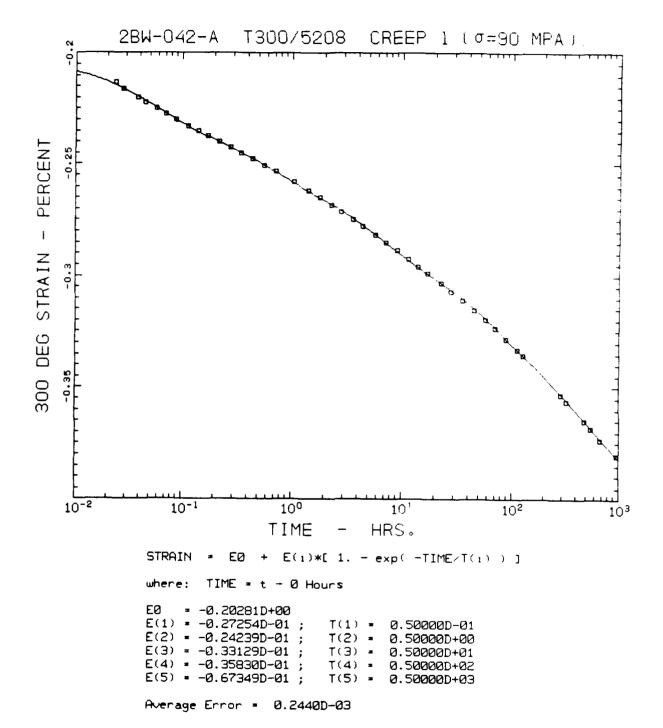
Average Error = 0.4453D-03

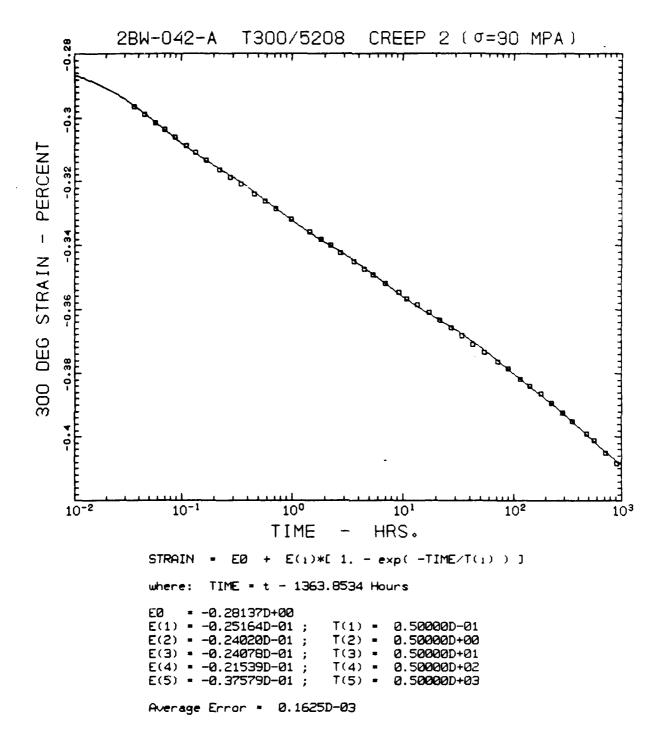
```
2BW-042-A
                            T300/5208
                                               CREEP 3 ( J=90 MPA)
STRAIN
DEG
180
                              10°
    10-2
                 10^{-1}
                                           10<sup>1</sup>
                                                        10<sup>2</sup>
                                                                     10<sup>3</sup>
                                                                                  104
                                          - HRS.
                                 TIME
                           EØ + E(1)*[1. - exp(-TIME/T(1))]
                STRAIN
                        TIME = t - 3362.9292 Hours
                where:
                        0.81914D+00
                EØ
                        0.40617D-01;
                E(1) =
                                          T(1) =
                                                   0.50000D-01
                E(2) =
                        0.43126D-01;
                                          T(2) =
                                                   0.50000D+00
                                                   0.50000D+01
0.50000D+02
                E(3) =
                        0.45831D-01;
                                          T(3) =
                        0.54416D-01;
                                          T(4) =
                        0.47529D-01;
0.10970D+00;
                                                   0.50000D+03
                                          T(5) =
                E(5) =
                E(6) =
                                          T(6) =
                                                   0.50000D+04
```

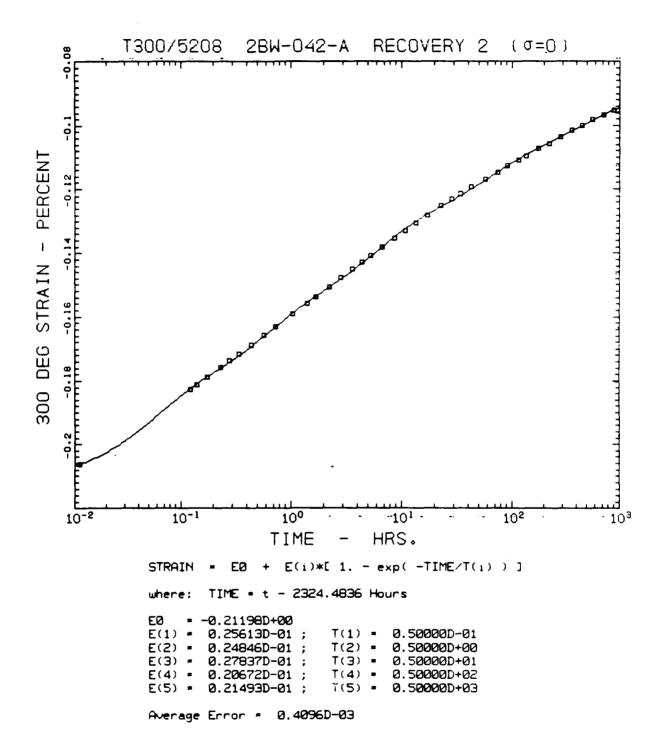
Average Error = 0.9594D-04

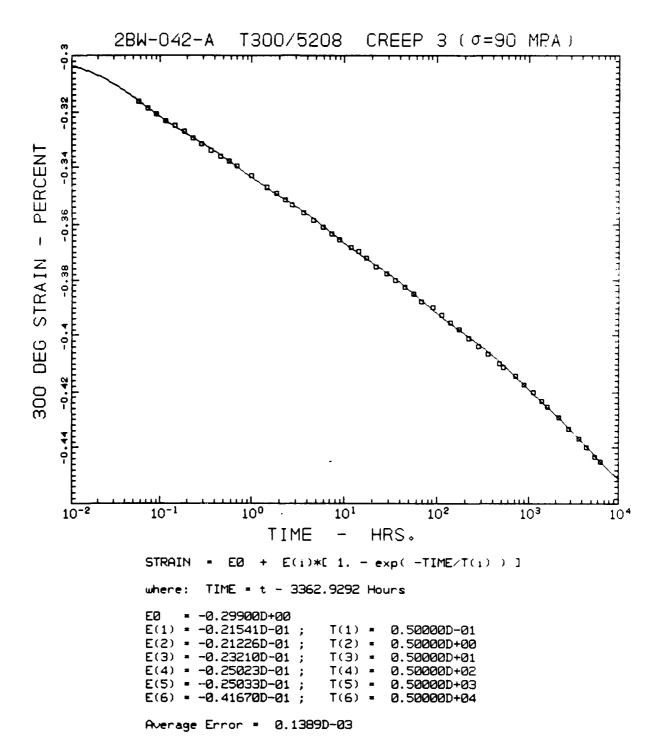


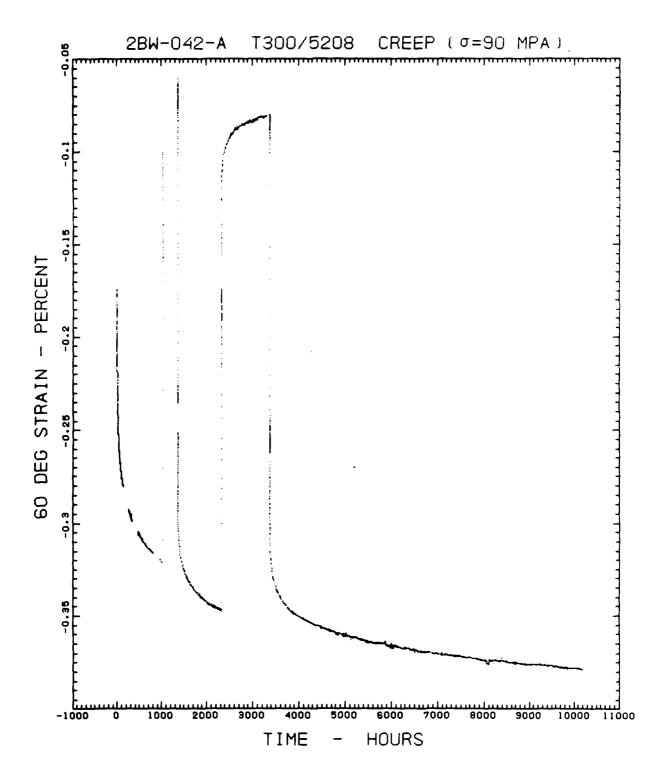
- ,250-

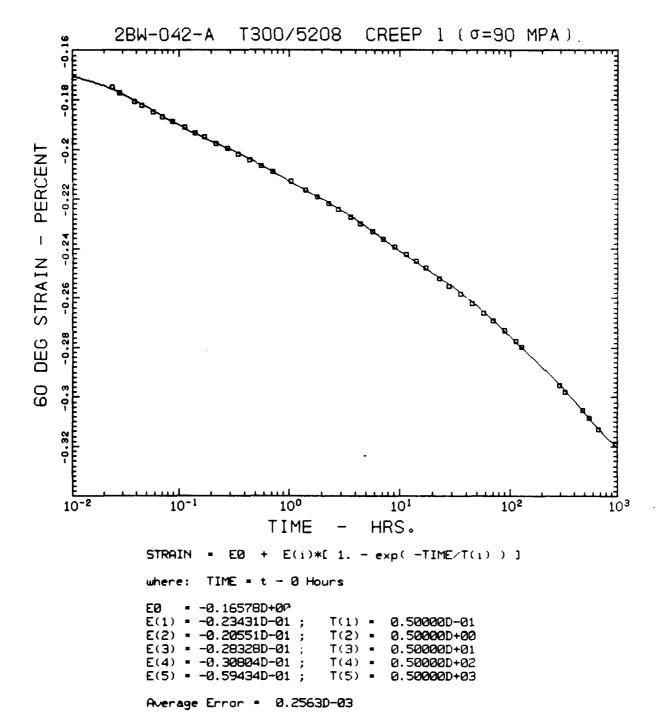


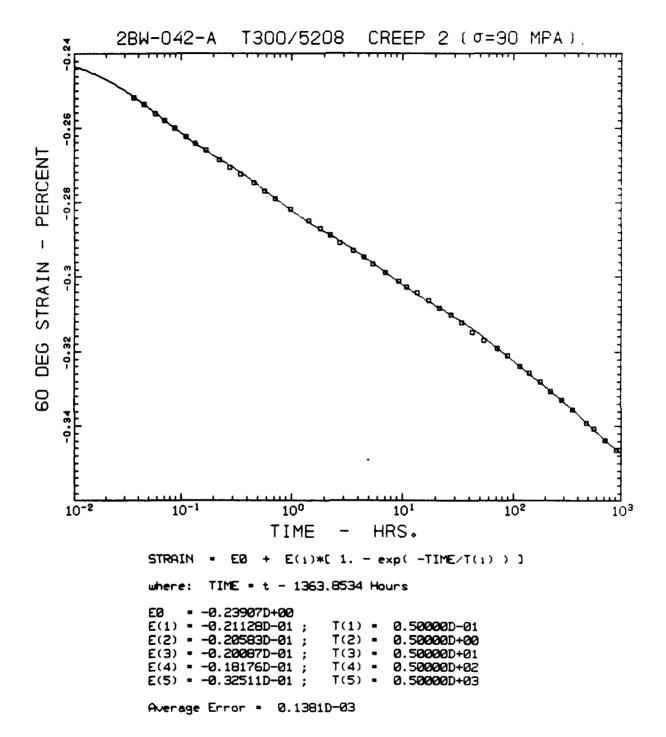












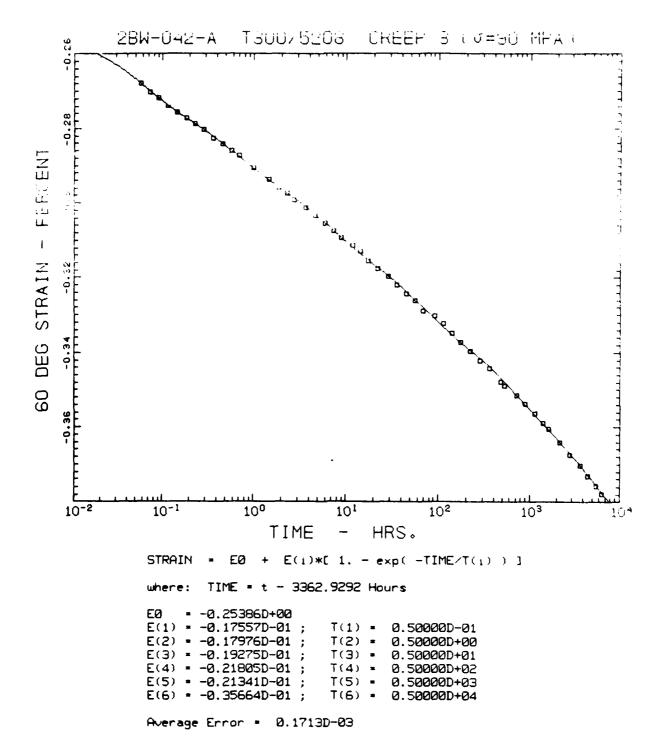
```
T300/5208
                                     2BW-042-A RECOVERY 2 (σ=0)
DEG STRAIN
                                            10°
                                                                                    10<sup>2</sup>
                        10-1
                                                                                                        10<sup>3</sup>
     10-2
                                          TIME
                                                    - HRS.
                                         + E(i)*[ 1. - exp( -TIME/T(i) ) ]
                    STRAIN
                               TIME = t - 2324.4836 Hours
                    EØ
                           - -0.17998D+00
                    E(1) = 0.20957D-01;

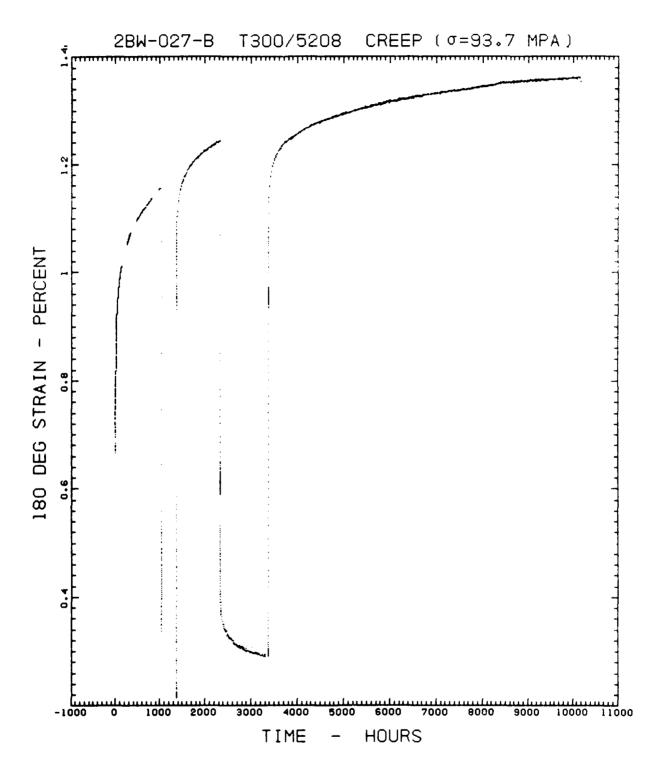
E(2) = 0.21315D-01;

E(3) = 0.22780D-01;

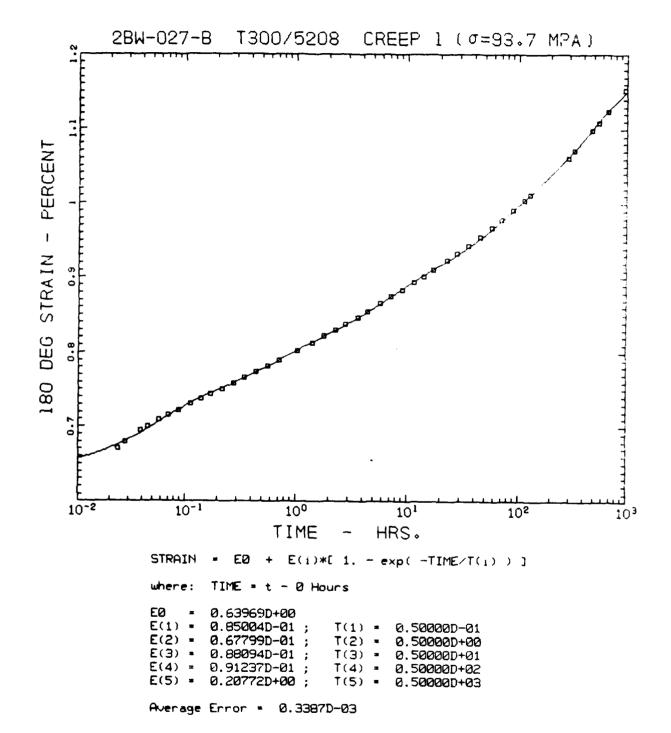
E(4) = 0.17066D-01;

E(5) = 0.20304D-01;
                                                     T(1) =
                                                                0.50000D-01
                                                     T(2) =
                                                                0.50000D+00
                                                                0.50000D+01
0.50000D+02
0.50000D+03
                                                     T(3) =
                                                     T(4) =
                                                     T(5) =
                    Average Error = 0.4698D-03
```

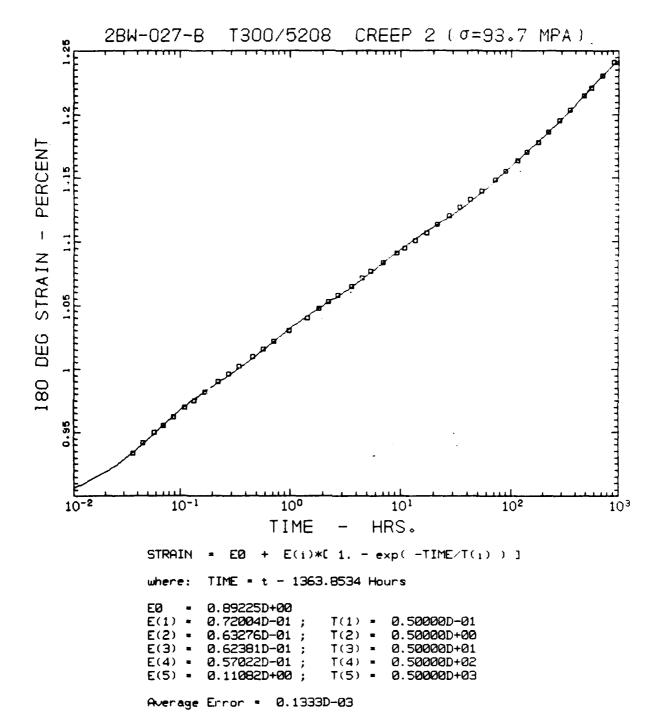


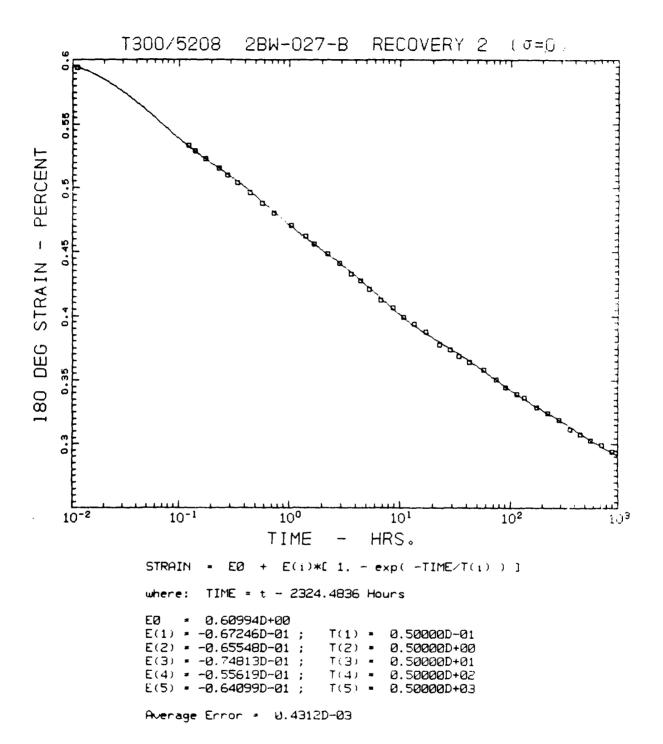


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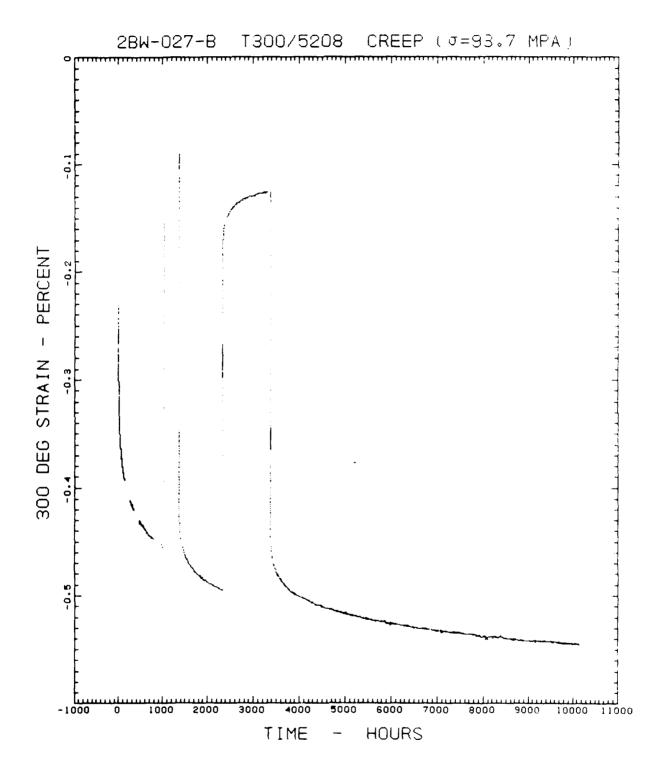
```
T300/5208 CREEP 3 (σ=93.7 MPA)
            2BW-027-B
- PERCENT
STRAIN
DEG
180
                                   100
     10-2
                    10-1
                                                   10<sup>1</sup>
                                                                   10<sup>2</sup>
                                                                                   10<sup>3</sup>
                                                                                                  104
                                        TIME
                                                 - HRS.
                                      + E(1)*[ 1. - exp( -TIME/T(1) ) ]
                   STRAIN
                             TIME = t - 3362.9292 Hours
                             0.95311D+00
                   ΕØ
                   E(1) =
                             0.56096D-01;
                                                  T(1) = 0.50000D-01
                   E(2) = 0.57955D-01;

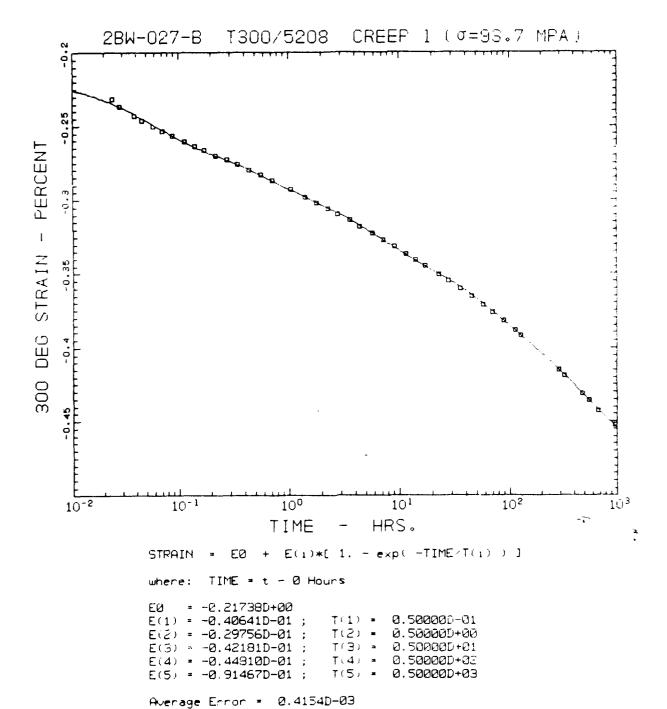
E(3) = 0.58148D-01;

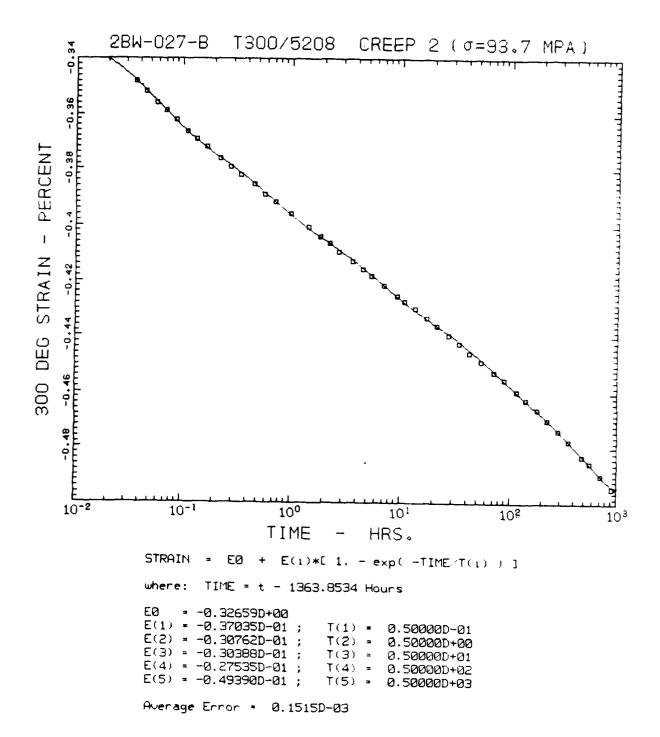
E(4) = 0.70558D-01;

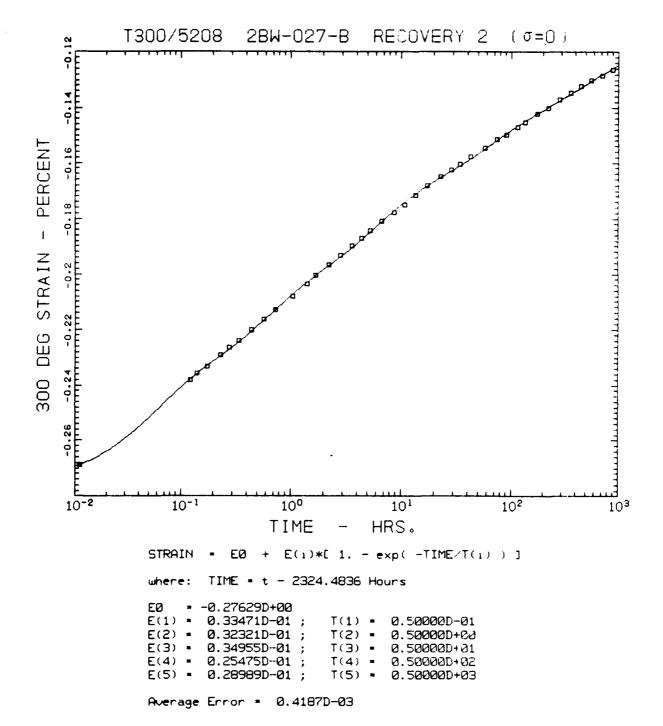
E(5) = 0.61978D-01;

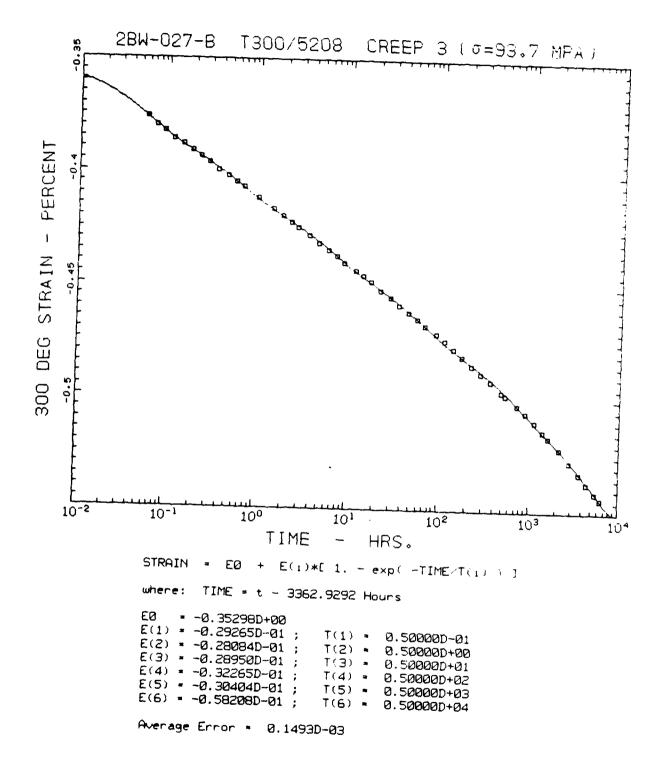
E(6) = 0.14247D+00;
                                                             0.50000D+00
                                                  T(2) =
                                                  T(3) *
                                                             0.50000D+01
                                                  T(4) =
                                                             0.50000D+02
                                                             0.50000D+03
0.50000D+04
                                                  T(5) =
                                                  T(6) =
                   Average Error * 0.1200D-03
```

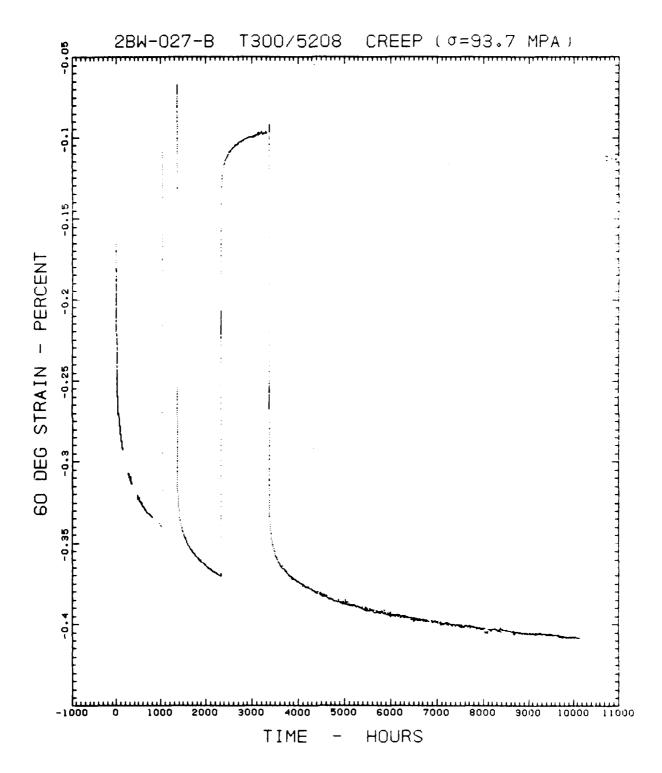


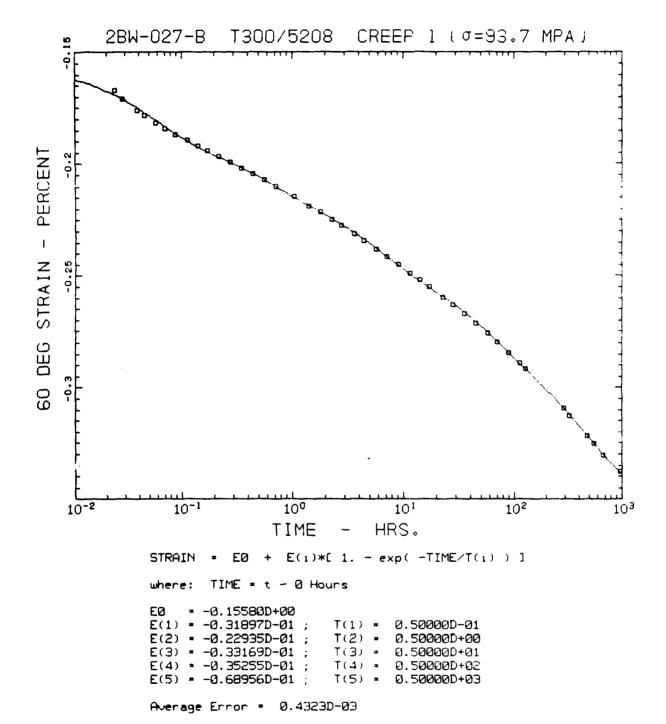


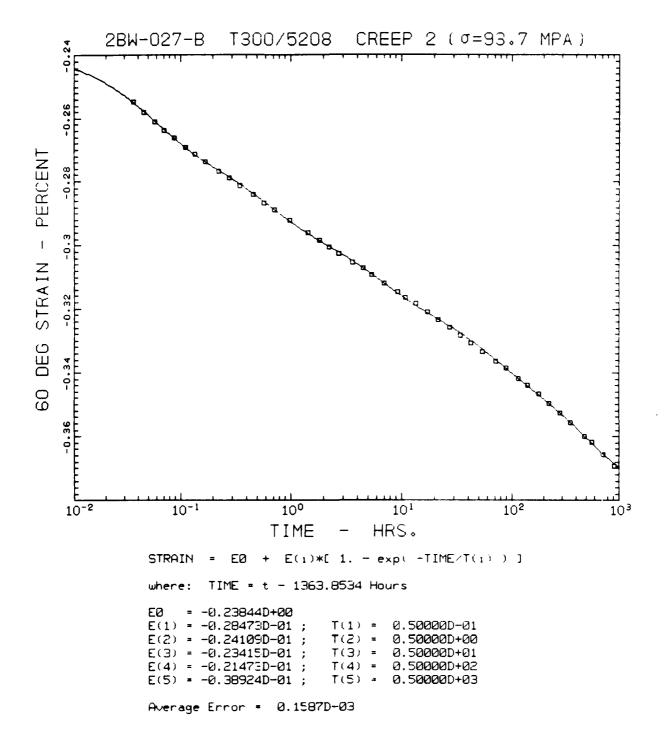


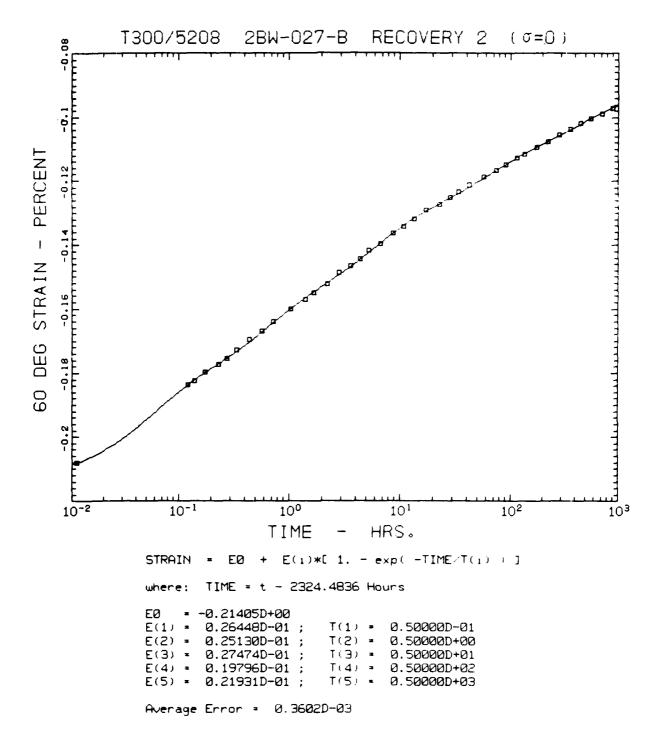


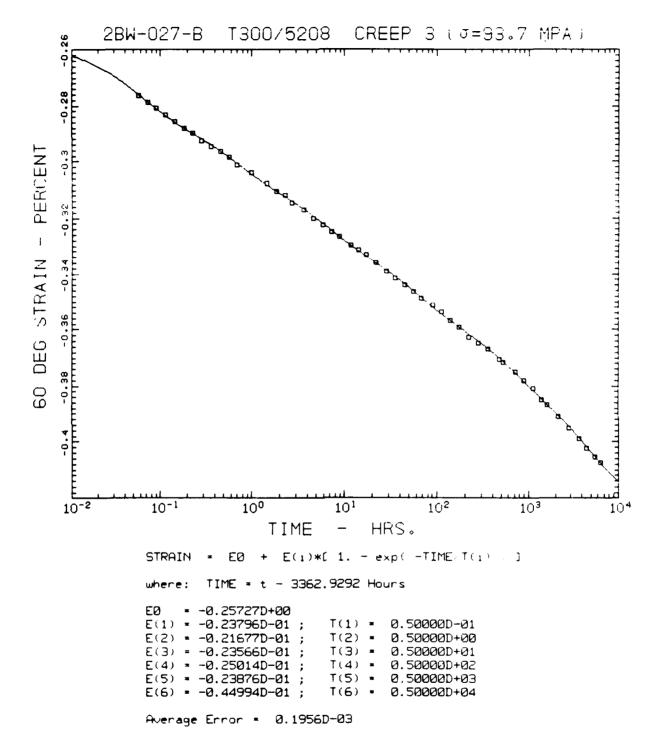


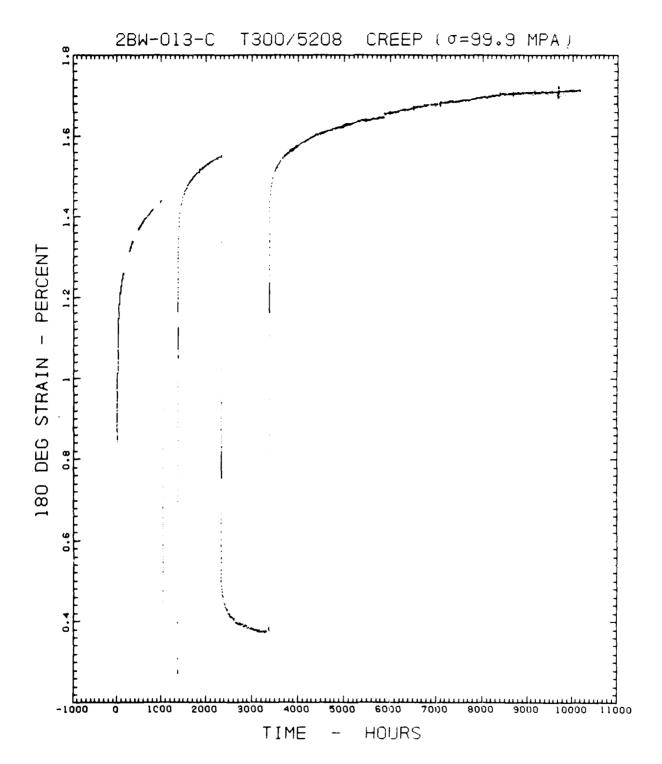


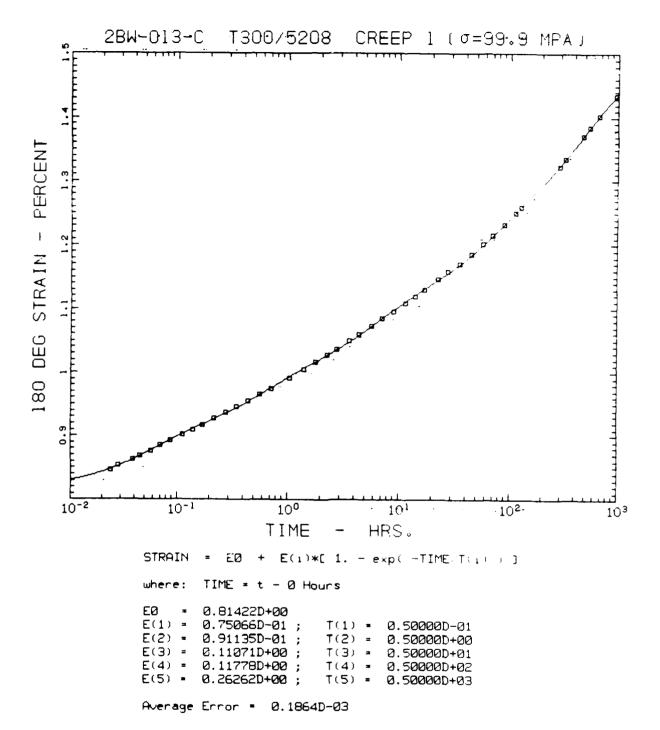


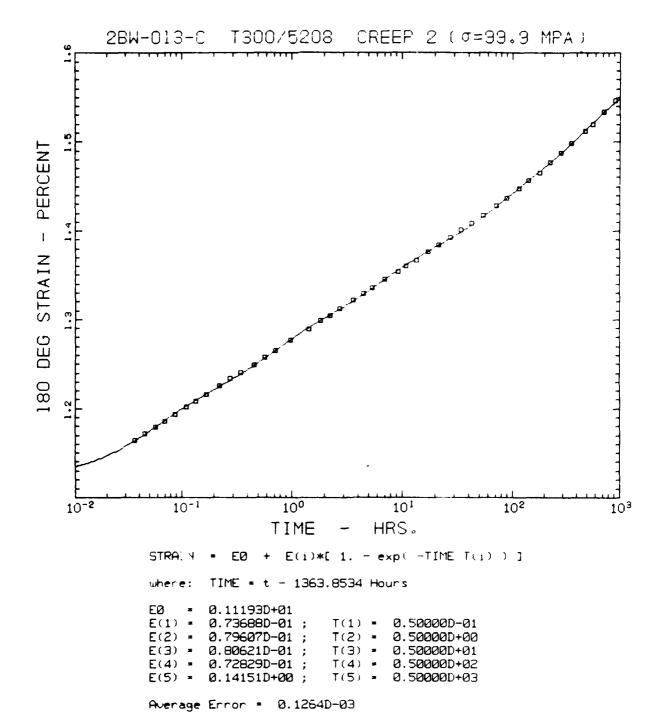


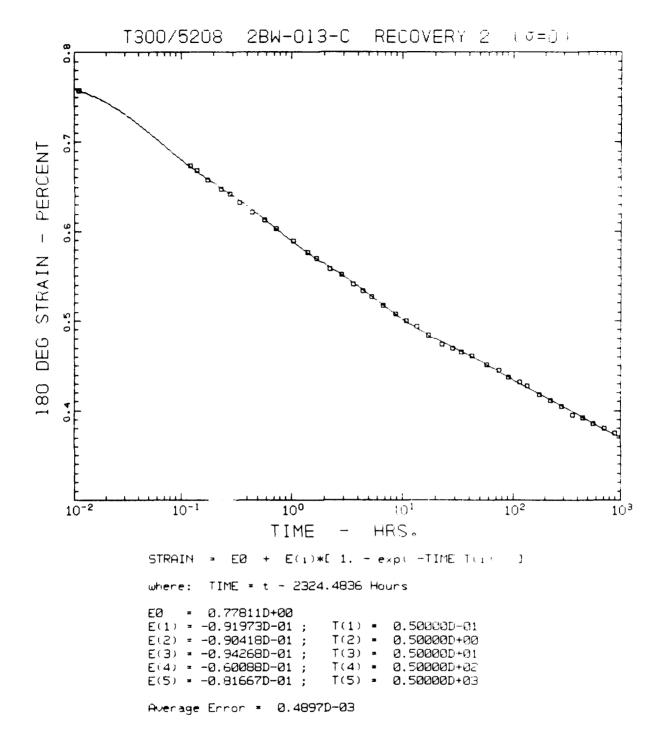


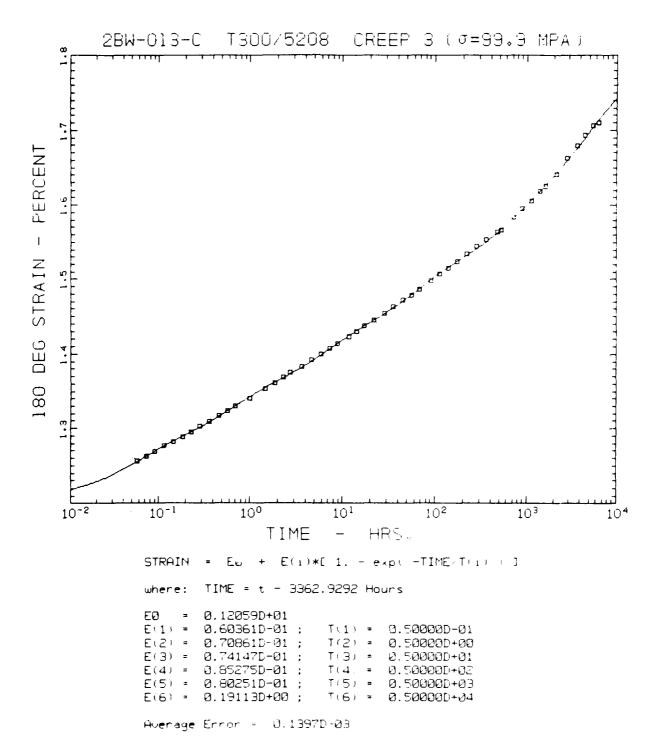


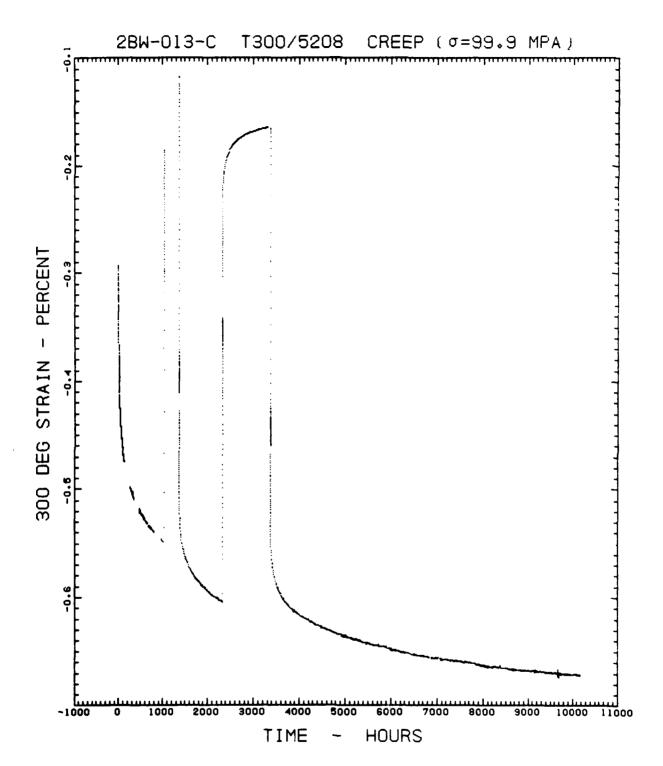


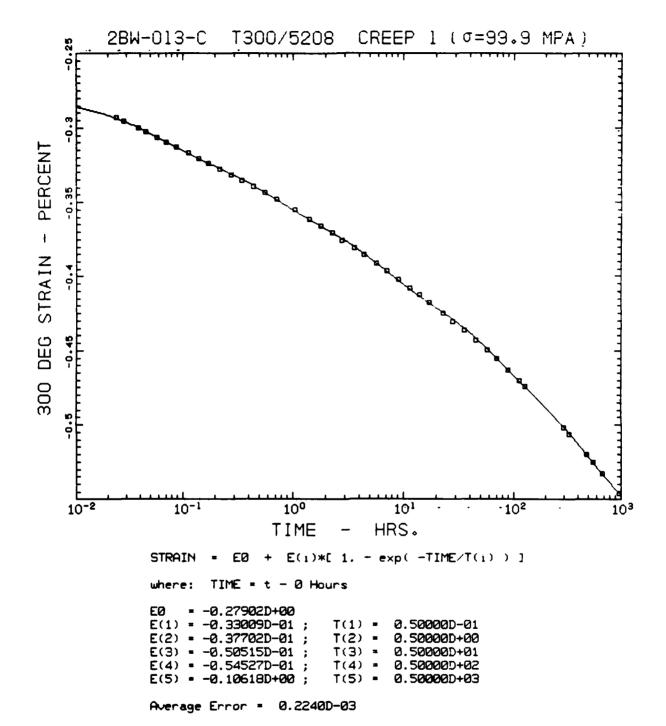


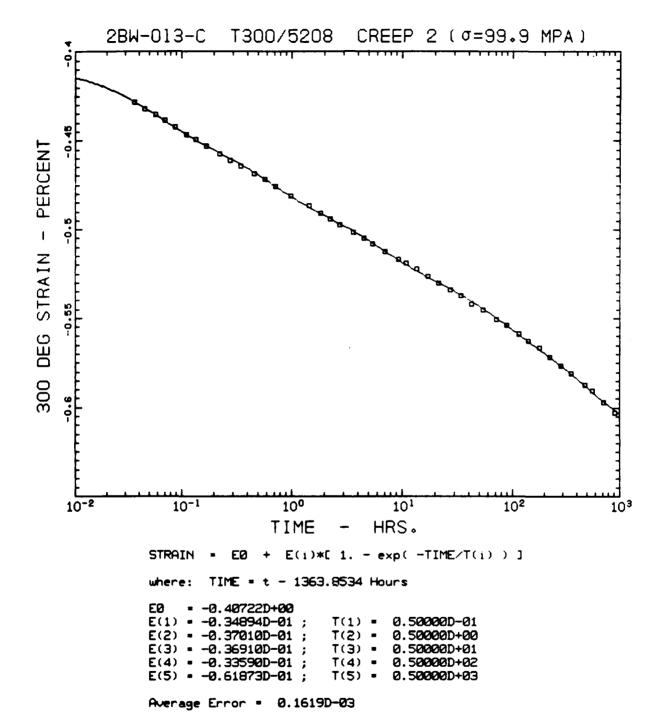


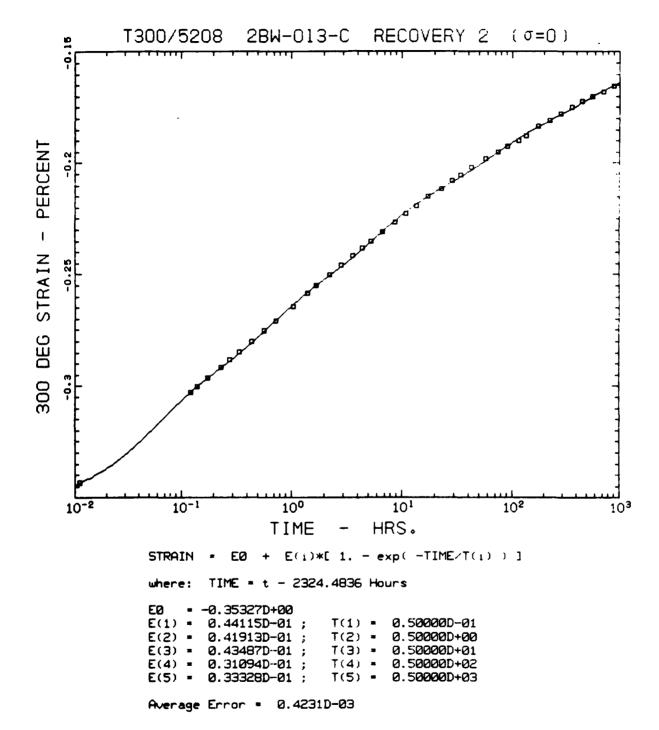


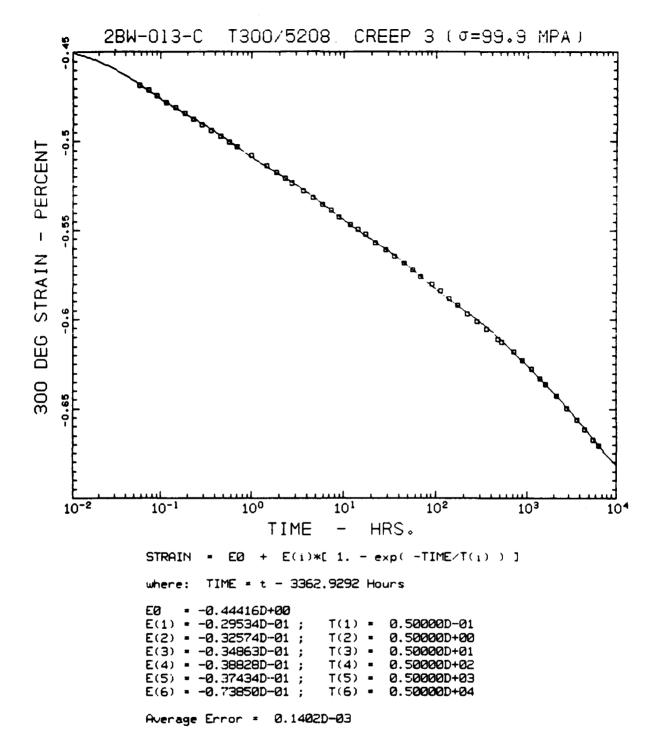












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